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Therapeutic Gazette.

Whole Series, Vol. XV. | DETROIT, MICH., PHILADELPHIA, PA., } April 15, 1891. | Third Series, Vol. VII. No. 4.

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Original Communications.

ON THE VALUE OF THE INHALATION OF CHLORINE GAS AND THE USE OF IODINE AND CHLORIDE OF GOLD AND SODIUM HYPODERMICALLY IN THE TREATMENT OF PULMONARY CONSUMPTION,

WITH AN ABSTRACT OF THE CLINICAL HISTORY OF TWENTY-SEVEN CASES.

BY HENEAGE GIBBES, M.D.*, AND E. L. SHURLY, M.D.†

IN answer to many requests, suggestions, and inquiries, we herewith publish notes of further observation upon the treatment of phthisis pulmonalis with iodine and gold and sodium chloride hypodermically and chlorine gas locally, together with some case histories illustrating the same. While our experience is yet too limited to determine accurately its real value compared to other plans of treatment, still its use, more or less, for about eight months on human beings has given us some data which may prove interesting.

First, have we a theory? Yes. We have a theory founded on facts that general tuberculosis and phthisis pulmonalis, as diseases, are entities differing considerably,—the one a general disease in which the anatomical lesions may be found in all the organs of the body; the other, with anatomical lesions principally and primarily in the respiratory apparatus; the final course of the former (tuberculosis) depending upon a destructive taking the place of the constructive metabolism, and concerning the bichemical actions belonging to either protoplasm, nuclein, or chloromin, or all combined, and depending upon either hereditary or acquired tendency to elemental perversions of nutrition: these resulting in the formation of chemical poisons known as toxalbumoses.

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To the query as to what is meant by inherited tendency may be mentioned syphilis and acquired exhaustion from mental overwork, worry, pernicious habits of life, bad surroundings, etc. Regarding the bacillus tuberculosis as a factor, we do not deny its universal existence in nature and the possibility of its spores entering the interfascicular lymphatic spaces through the pseudo-stomata in the air-cells, thence into the lymph-current to the bronchial glands, but believe that these spores, having thus passed into the tissues, cannot germinate unless they find a suitable pabulum, which in the case of the tubercle bacilli we believe to be caseous matter; and we consider this to be proved by the fact that in inoculated animals we do not find tubercle bacilli in the lesions until caseation has taken place; it would, therefore, seem that some substance associated with them constitutes the real virus.

Phthisis pulmonalis we believe to be a disease located in the pulmonary organs, and in each instance an inflammatory process of greater or lesser degree or extent resulting in permanent or destructive changes of the tissues, which are likewise accompanied by the production of deleterious chemical substances which set up constitutional disturbances and exhaust the vital forces. The particular form of degeneration known as caseation is probably peculiar to the lungs, lymphatic tissues, etc., although in the present state of our knowledge it cannot be differentiated from apparently similar processes in other organs. Hence, with such ideas, we have been working for the last few years to find something which would combine with and neutralize these tox-albumoses, or whatever they may be, and arrest the disease process. To this end we have labored, with the result that we find that chlorine gas, iodine, ammonium iodide, potassium iodide, the double salt of chloride of gold and sodium, liquor potassæ, potassium permanganate, iron arseniate, the mercurial salts, etc., will do good service. Chlorine gas, iodine, and the double salt of gold and sodium chloride, however, are by far the most efficacious. In the first place, these substances must be chemically pure, and the solution must contain glycerin. We have been trying solutions made with ether, lanolin, oleic acid, fixed oils, etc., especially with iodine, but whether we can obtain such good results as with the glycerin is a question yet to be determined.*

* Dr. Clark has been indefatigable in this work, having made solutions with almost every solvent known to chemists, the interesting results of his labor in this line will be published soon.

CHLORINE GAS.

There are two modes of administering chlorine. First, the gas may be evolved from chlorinated lime (which is nearly one-half chlorine) by the addition of dilute hydrochloric acid. In a small room or compartment of about five hundred and fifty cubic feet place from one-half drachm to six drachms of chlorinated lime spread out in a saucer or shallow glass dish, and to this add slowly from one to three drachms of dilute hydrochloric acid, stirring with a wooden spoon or spatula. There are few cases requiring as much as the six drachms. One-half drachm is the commencing amount, and more should be used each day until about three to four drachms is reached. Before the gas is evolved the atmosphere should be well charged with a spray of a saturated solution of sodium chloride. It will take about two ounces of the solution to do this, but more will be required if the room is not comparatively air-tight. The spray should be continued during the evolution of the gas; in fact, during most of the time the patient is there. The patient should be directed to keep the mouth closed and breathe through the nose. It seems in a majority of cases that mouth-breathing during the inhalation leads to coughing. The first sitting may be about two minutes, while the subsequent ones may be increased to twenty or thirty minutes. One or at most two sittings are sufficient, although some cases will require three or four daily.

The other method for inhalation of chlorine, and one which is preferable for mild cases and for laryngeal phthisis, is the inhalation of chlorine water. The chlorine water should be made according to the U. S. Pharmacopœia, and may be mixed with a saturated solution of salt in the proportion of one-half, one-third, or one-fourth, and from one-half to two ounces of the mixed solution may be vaporized at a sitting. Should much irritation follow an inhalation for any considerable time, less must be used.

Cases of laryngeal phthisis where there is not much "breaking down" ought to be treated with the weaker solution, while those showing considerable ulceration will need frequent sittings and stronger solutions. A face inhaler, such as is used in Harper Hospital,† offers the best mode of administration.

Chlorine inhalations seem to be very efficient in preventing further caseation, as shown by changes in the sputum and the alteration of some of the physical signs under its use. A

† The Harper Hospital Inhaler can be procured of Milburn, Woodward Avenue, Detroit.

varying tolerance to it will be observed from time to time, probably owing to the quantity of secretion present in the bronchial tubes at time of inhalation. Usually it is better for the patient to inhale soon after a thorough expectoration and not too near meal-times, as not unfrequently there is a striking effect upon the stomach, as shown by nausea or vomiting, which may be brought about through the nerve-centres. The gas is practically irrespirable unless diffused in vapor of chloride of sodium. This was probably the reason for its abandonment by Gannel, who gave it by inhalation in 1828.

Hypodermic Injections.—On account of the changes which chemicals undergo in the stomach and intestines before diffusion throughout the system, it is almost impossible to obtain certain effects, especially upon those morbid products known as toxalbumoses. It is, therefore, necessary to avail ourselves of some other way for introducing medicaments into the body, and perhaps there is no better way than by the hypodermic method. The instrument should be provided with either gold- or platinum plated needles. Any hypodermic syringe which can be kept clean and aseptic will answer the purpose. Owing to the action of both iodine and gold on the packing and needle, it is difficult to keep the instrument in order without great attention. Immediately after its use it should be cleansed with warm water, and then with alcohol, after which it should be charged with a five per cent. solution of carbolic acid, which may remain in the barrel for at least ten minutes. Just before using again, it should be cleansed with warm water. Whenever the needle becomes rough or dull, it should be thrown away. Regarding the place for insertion, we have found the gluteal region preferable, because there is less pain, danger of abscess, or ulceration of the skin. Probably other regions may offer as favorable a site in some individuals. The iodine solution gives considerable pain to some people, to others very little, but the gold solution gives little or none. We hope that a solution can be made with lanolin, or something of that sort, which will obviate this objection in the case of iodine. With a majority of patients we find it better to begin with the iodine $\frac{1}{12}$ grain daily, gradually increasing until reaching $\frac{1}{2}$ grain, and in some instances 1 grain; then the gold and sodium solution may be injected daily, beginning with $\frac{1}{80}$ or $\frac{1}{20}$ grain, and gradually increasing until reaching $\frac{1}{5}$, or even $\frac{1}{4}$ grain at this point, the quantity should be diminished to $\frac{1}{10}$ grain daily if the medication is to be continued. At this stage it will be found often better to alternate them, one day using iodine and the next gold. If albumen appears in the urine, the iodine must be suspended, and the gold alone used. The continuance of large doses of the gold and sodium salt may produce a golden color of the skin, which can possibly be attributed to bile. During the administration of iodine in this way, the patient usually loses weight, and if, having had previously a tendency to catarrh of the bladder or intestines, this condition may be again set up.

The temperature also usually increases for a week or ten days, and may be accompanied by excessive sweating. The expectoration soon becomes lessened, and watery later on. Asthmatic symptoms and anorexia may in some instances supervene, the tongue becoming heavily coated, and, when the point of saturation is reached, diarrhœa comes on, the throat is dry, and the patient listless. The pulse may be quickened, but does not seem to loosen its tension. These symptoms occur only in a small percentage of the cases. The injection of gold and sodium in these cases is followed by a tonic reaction, these symptoms gradually disappearing, excepting perhaps the anorexia. In large doses of the gold and sodium, vertigo and nausea may appear occasionally. Our experience would show that the majority of patients do better on smaller than on large doses. One feature which seems to be quite constant in cases showing rapid improvement is the supervention of asthmatic symptoms, such as sibilant râles, which may be due to the astringent action of the gold. There has been little or no tendency to hæmoptysis, although blood-streaked mucus is sometimes observed under large doses of iodine. In three cases enlarged lymphatic glands rapidly disappeared. After two or three weeks, as a rule, these chemicals ought to be used alternately every day or every other day; finally once or twice a week. Iodine cannot be used alone for any great length of time, but the gold and sodium salt can; therefore, by using them alternately, the effect of the iodine may be prolonged.

The following cases have been taken at random from the clinical records of Harper Hospital:

Case I.—Wm. C., aged 22; native of Detroit; single; occupation, clerk in railroad office; good habits.

Family History.—A number of father's family have suffered with phthisis. One older brother of patient has phthisis. Has generally been well until January, 1890, when he "took

cold," and has coughed since with increasing expectoration and has been losing weight; has had no hæmoptysis, but has expectorated bloody mucus; chills and fever irregular; some night-sweating; no diarrhœa, but indigestion; not hoarse; no sore throat; no nasal catarrh or stenosis; was not with brother much; never been a milk-drinker to any extent.

August 12, 1890.—Very pale and thin; height, five feet ten and a half inches; weight, one hundred and twenty-three pounds; fingers slightly clubbed; nostrils dilated; able to be up part of the day and go out; respiration 32, pulse 96, temperature 101°; considerable cough and expectoration at night and early morning; tubercle bacilli in sputum; no appetite.

Physical Signs.—Dulness on percussion over upper left front and back; bronchial respiration; bronchophony and thick moist râles over same region; upper right front and back, coarse respiration.

Treatment.—Hypodermic injection of iodine, $\frac{1}{11}$ grain daily; also inhalation of chlorine water and solution of sodium chloride, equal parts daily; also 3 grains each of bone-meal and ferri carbonate three times a day, and a teaspoonful of a syrup of rum, molasses, and paregoric during evening and night to allay cough.

During first week temperature remained higher, 101° during the afternoon, and 103° in the evening and at times in the middle of the day. Complained of weakness and cough, although expectoration was easier. The latter part of August, however, the temperature had fallen to 99.5° and 101°. There were no night-sweats, but considerable diarrhœa and nausea, and soreness of throat. The expectoration had diminished considerably in character, but still contained tubercle bacilli. The dose of iodine, however, had been increased until he was getting ½ grain. At this time hypodermic injections of gold and sodium were substituted for the iodine, beginning with $\frac{1}{20}$ grain. This was continued daily, increasing the dose every second day until $\frac{1}{8}$ grain was reached, which produced nausea and dilatation of the pupils. It was now dropped to $\frac{1}{10}$ grain daily until September 14, when the injections of iodine and gold were used alternately every other day,—⅓ grain iodine and $\frac{1}{10}$ grain gold and sodium. During October, November, December, January, and February he was subjected to about two to three injections a week, with three inhalations, and during March he has had one injection of gold and sodium, $\frac{1}{8}$ grain, every week, with three inhalations. He has had no medicine *per orem* excepting on a few occasions a cathartic. Since September 10 has walked out nearly every day. Has had no abnormal temperature since early in November. Has very little cough in the morning, and not more than two drachms of expectoration in twenty-four hours, except after being out on a windy day and after inhalation. There are no tubercle bacilli in the expectoration; appetite is good, bowels are regular, digestion is good, and he sleeps well. Physical signs show slight dulness over upper left front and coarse respiration with abnormal transmission of heart-sounds and creaking on forced inspiration. He has also nearly regained his normal weight.

Case II.—E. J., clerk; good hygienic surroundings; single; native of Michigan; lost one brother of phthisis, otherwise family history good. He was generally well until he took cold at a parade in September, 1889, and was sick in bed for three weeks with, he says, pneumonia; since this he has continued to cough, at first without much expectoration, but latterly increasing.

He had been having more or less pain in his chest, especially the left side, and notices an increase of breathlessness upon exertion, and he has never recovered strength or weight since his last illness. His appetite has been fair most of the time, however, and no diarrhœa or dyspepsia appeared.

His principal complaints are a harassing cough, pain in the chest, and debility, and also nocturnal sweating occasionally.

At the time he was seen he had elevated temperature, rapid pulse, rapid respiration, and was pale and emaciated.

Physical examination of the chest showed dulness on percussion over the whole left side, bronchial respiration, bronchophony over upper right front and back, with a small cavity in the lower portion of the left infraclavicular region showing cavernous respiration with gurgling râles, and tubercle bacilli in his sputum. Right side appeared emphysematous, and the percussion resonance high pitched over the right back, with moist crackling in the right and left interscapular region.

He was sent to Harper Hospital February 18, and treated with inhalations of chlorine gas and the internal administration of Lugol's solution of iodine, extract of malt and whiskey alternated with the salicine and malt mixture, with occasional doses of quinine.

The chlorine gas was administered alone with air and with the sprays of bicarbonate of sodium, bicarbonate of ammonium, petrolina and olive oil, and carbonate of magnesia, but

without much effect, as he was unable to bear this until the latter part of his stay, when it was administered with the spray of chloride of sodium, and from March 5 to 25 he received two inhalations daily, and was also put in the cabinet daily during the last week in the hospital.

He continued to improve, and physical examination on March 24 showed the left lung clear, the respiratory murmur returned, the gurgling râles at the seat of the breaking down had disappeared, leaving a soft, low-pitched, cavernous respiration at that spot, and there still remained a high-pitched resonance on the right side, with a prolonged murmur; much better evening temperature, during the last ten days reaching only 95.5° in the evening; expectoration greatly diminished, but still a good deal of cough, but no nocturnal sweating. Left hospital March 25, and on April 25 went to Colorado and remained until the following August. He presented himself for examination on August 8, apparently very much improved. The physical signs previously noted had disappeared, but broncho-vesicular respiration still remained over the left lung; bronchophony and abnormal heart-sounds were heard in the infraclavicular region. He still had considerable cough night and morning, but had gained flesh and strength, and his appetite was good, also his digestion, and he had no elevation of temperature.

On August 28 he presented himself with increased cough, temperature of 99.5°, and stated that his appetite was diminished and he was restless at night. I ordered a tablespoonful of Parke, Davis & Co.'s emulsion of oil of eulicum three times a day after meals; also hypodermic injections of 1/6 grain of iodine and solution of potassium iodide, which he received every day for ten days, after which signs of abscess appeared at the seat of injection, and this was discontinued.

He also had during this time inhalation of chlorine water, with a solution of chloride of sodium daily. Temperature increased so that he rarely had when examined a temperature less than 100°, which was probably due to the abscess.

Physical signs showed mucous râles over the whole upper front, with mucous crackling. The abscess was discharging, but finally healed, and the hypodermic injections of chloride of gold and sodium were used instead of iodine on September 18, and were continued until October 2, when, another abscess threatening, this also was stopped; but at this time we succeeded in obtaining from Dr. Clark pure chemicals, and no further trouble arose from abscesses, and he has now been much better. Temperature 98.5° to 99.5°; cough and expectoration very much lessened; strength returning; and from November 6 to February 1, 1891, he has had two injections weekly, and from one to two inhalations of chlorine; during February he has had but one injection of iodine. He seems perfectly well, seldom coughs, and has no expectoration. Expectoration of September 5 contained a few tubercle bacilli, but on examining what little we can collect now, none can be found. He is taking no medicine, is apparently well, and has resumed his occupation.

We have recommended him, however, to reside in New Mexico or Colorado for two or three years.

CASE III.—Miss J. C., native of Detroit; school-teacher; lives in good hygienic surroundings, with plenty of good food; not much of a milk-drinker; never very fleshy, nor very strong.

Family History.—She lost two maternal aunts and one sister of phthisis; was not with her aunts or much with her sister during their illness; was subject to taking cold, but in tolerable condition until about November, 1889, when she "took cold," and continued coughing, having occasionally chills, fever, and night-sweating, and in latter part of December had a hæmoptysis (probably two ounces). From this time she continued to feel badly, although not expectorating much; continued attending her school irregularly. On January 1, 1890, she was in the following condition: Pulse 96; frequent cough and little expectoration; temperature 100°, respiration 26; skin dry; tongue coated; no diarrhœa, but poor appetite; says she is easily tired, and has pain in left chest and shortness of breath upon exertion; menstruation scanty.

Physical Signs.—Slight dulness on percussion over upper left front; bronchial respiration diminished, fremitus, and exaggerated vocal resonance, with dry crackling on forced respiration over same region extending down to third rib.

Treatment consisted of counter-irritation, rest and the administration of quinine and iodoform with creosote, and thymol inhalation. She gradually grew better, and in the middle of February resumed her school duties, which she continued for part of each day. March 1 she felt better, still coughing and having a temperature of 99.5° to 100° at night; appetite better; forced herself to eat because very anxious. During April she did very well, but in early

part of May grew worse; had slight hæmoptysis. Temperature ranged daily from 98° to 101°; more pain in chest, and more cough and expectoration; night-sweats appeared and diarrhœa for a few days. She was treated with quinine and salicin, and rest enjoined; she now resigned her position in the school.

Physical exploration of the chest showed mucous râles over upper left front; expectoration showed bacilli. During May she continued very ill, although up and about a little every day. During this time she had inhalations of bichloride of mercury, creolin, creosote, and resorcin, anodynes to allay cough, and syrup of the iodide of iron, with nutritious food. May 28 to 31 she was worse, having high temperature (at night 104°), anorexia, diarrhœa, and more cough and expectoration. She grew better in a few days, and left the city with friends, about June 15, for the upper part of the State. She remained away until the middle of August, when she returned somewhat weaker, with more cough and expectoration again, and higher temperature; her appetite, however, was better, digestion good, and bowels in good condition. She had taken while away bone-meal and extract of malt, with some whiskey once or twice daily, with nutritious diet. She remained in about the same condition until September 10, when the temperature increased, as also the cough, pain in the chest, and expectoration. She was growing weaker, although yet able to be up the greater part of the day; was very much emaciated and having night-sweats again; hoarse and having sore throat; sputum contained tubercle bacilli.

Physical signs showed mucous râles and moist crackling over upper left and cavernous respiration with creaking at left apex; bronchophony, also broncho-vesicular respiration and coarse râles over upper right front and over left back. Laryngeal examination showed redness and swelling of the upper larynx, with uniform swelling of arytenoids, ary-epiglotic folds, and ventricular bands, but epiglottis not swollen; no erosion could be seen anywhere. She was now given hypodermic injections of $\frac{1}{12}$ grain iodine daily, and an inhalation of chlorine water and solution of chloride of sodium. The iodine was increased $\frac{1}{6}$ grain the third week, when the gold and sodium was substituted, owing to increased mucous expectoration, diarrhœa, and skin eruptions coming on. After the fourth week she received injections (and a few times the solutions mixed) every other day, every second, third, fourth, fifth, and sixth day, and so on; she now receives one injection every two weeks.

The inhalation of chlorine water was kept up until February 5, since which time she has had none. Occasionally, for a complaint of faucial rawness, she received an inhalation of creolin from a face-shield inhaler. She was treated mostly with the iodine solution, ranging from $\frac{1}{12}$ to $\frac{1}{3}$ grain.

October 18.—She seemed worse, and so continued for about a week, having an exacerbation of fever and chills, with increased cough and expectoration. She had also a remission of high temperature, etc., from November 3 to 6, and again from January 2 to 8, but otherwise has gradually improved in every way until now. Since February 15 the temperature (taken irregularly) has shown no elevation; pulse 80 to 84; appetite and digestion good. She resumed her duties as teacher after the holiday vacation, and has lost no time since. She has taken little or no medicine per orem since early in January, and the physical signs clearly show retrogression of the process. Her voice is slightly husky, but larynx examined shows only a thickening of the ventricular bands. There is no odynphagia.

Case IV.—A. P., aged 25; American; married; height, six feet; normal weight, one hundred and seventy-five pounds; present weight, one hundred and twenty-five pounds; farmer three years, formerly cooper; habits good.

Family History.—Good, excepting paternal grandfather died of phthisis. Previous history: Was well until about four years ago, at which time he underwent great exposure, taking cold; says he had pneumonia. Has since that time occasionally expectorated clear blood; has coughed ever since more or less during the winter; for the last year has had fever occasionally; continual discharge from right ear, but not much expectoration until within the last six months, since which time he has been gradually losing flesh and strength. Last three months expectoration has been very considerable. He also had chills and fever, with occasional diarrhœa. Appetite has been capricious. Has not been exposed to phthisical patients.

October 27, 1890.—Pale, very thin; pulse 110, temperature 100°, respiration 28; appetite poor, tongue coated, bowels regular.

Physical Signs.—Percussion dull over upper left front and back; bronchial respiration; bronchophony; moist crackling over small area. Over the left mammary region and over the upper right front, broncho-vesicular respi-

ration; no râles. Examination of sputum shows pus and tubercle bacilli; laryngoscopical examination shows hyperæmia of the upper larynx, with only slight swelling; slight hoarseness at night.

Treatment.—Hypodermic injections of gold and sodium chloride $\frac{1}{30}$ grain every evening; inhalation of napthalin in the inhaling-room twice daily; mixture of salicin, extract of malt, spiritus frumenti, given internally, three times daily at meal-times.

Temperature ranged, up to November 23, from 97° to 98° in the morning to 101° to 102° in the evening; from the 23d to the 30th it greatly diminished, ranging from 98.5° to 99° and 99.5°; from that time to the time of leaving the hospital (December 5), temperature ranged, with the exception of one evening (on the 3d), from 98.5° to 99°. Respiration at this time, from November 28 to December 5, was between 20 and 24; pulse from 76 to 90. Expectoration diminished to about one ounce in twenty-four hours, mostly in the morning. Hypodermic injections were increased from $\frac{1}{30}$ grain to $\frac{1}{8}$ grain. Temperature, taken half an hour after injection of $\frac{1}{8}$ grain, shows increase of temperature of one degree, which did not remain, however, more than half an hour longer. On November 23 one hypodermic injection of bisulphate of quinine (6 grains), was given on account of persistent feeling of chilliness. On November 21 he received a hypodermic injection of iodine, $\frac{1}{12}$ grain, increased on the 23d to $\frac{1}{6}$ grain, which was continued until December 21, when an injection of gold and sodium chloride, $\frac{1}{10}$ grain, was given each day during the remainder of his stay in the hospital. From November 20 to 24 he complained of a soreness of the throat; laryngoscopic examination showed increased congestion. The inhalations of napthalin were continued until the 19th, when chlorine gas with spray of solution of chloride of sodium were substituted and continued daily until his departure. Examination of urine during treatment showed nothing abnormal excepting the quantity of earthy phosphates. There was no trouble at the site of the injections in the gluteal regions.

December 2.—There were no tubercle bacilli in the sputum.

December 5.—Physical exploration of the chest showed no râles, but still coarse respiration at the upper left front. Injections of gold and chloride were continued at his home during December and January, at which time (the latter part of January) he was reported as having little or no cough, with gain in body-weight, and feeling perfectly well.

Case V.—T. C. P., aged 33; American; married; resides in city (cottage); habits good,—smokes and chews moderately; occupation, clerk in store.

Family history good. He has been generally well until a few months ago, when he began to cough and expectorated a little in the morning; about six weeks ago this became worse, together with a feeling of heat and restlessness; for the past three weeks has been feeling much worse and obliged to give up work; poor appetite; bowels constipated; feeling of chilliness several times daily, followed with sensation of heat; slight sweats at night towards morning; pulse 108, respiration 28; tongue coated; feeling of nausea; incessant cough; expectorations small in quantity, thick, and offensive; no tubercle bacilli present; pain in the chest.

Physical Signs.—Dulness on percussion; bronchial respiration and abnormal transmission of heart-sounds over the upper left front down to the third rib; no râles; prolonged and jerky respiration.

Treatment.—Hypodermic injections of iodine, beginning with $\frac{1}{12}$ grain, increased every second day until $\frac{1}{2}$ grain was reached. Inhalations of eucalyptol twice daily in the inhaling-room. Internally, salicin, malt, whiskey mixture, a tablespoonful three times a day; $\frac{1}{4}$ grain codeine in syrup of tolu to allay coughing at night. From November 23 one inhalation of chlorine gas was given daily, and was continued for about ten days on account of irritability of the pharnyx. From November 24 the temperature ranged from 97° in the morning to 100° and 101° at night. From the 24th to the 27th the evening temperature did not rise above 99°. The morning temperature on two occasions was 97° On the 28th, after an injection of iodine, $\frac{1}{2}$ grain, the temperature at 10 P.M. reached 102°. Also on the 29th, after an injection of $\frac{1}{2}$ grain, it reached 102.1°, and during that night copious perspiration and incessant cough; very free mucous expectoration during these two days and nights, with watery discharge from the nose. The following day physical exploration showed mucous râles all over both sides of the chest. The hypodermic dose used was decreased to $\frac{1}{8}$ grain, and he continued to receive $\frac{1}{8}$ at each injection from this on, with subsidence of these symptoms. Temperature range gradually changed until, from December 2 to 13, the evening temperature ran from 99° to 99.5°;

morning temperature, from 97.5° to 98.5°. The pulse range, from November 29 to December 13, was from 70 to 86. Respiration greatly lowered and remained from 20 to 22 from November 30 to December 13, when he left. Examination of sputum on November 21 showed numerous tubercle bacilli; fewer on December 2, and on December 18, five days after leaving the hospital, examination of the sputum showed no bacilli present.

Physical Signs.—On the 1st of December, no appreciable dulness on percussion; bronchovesicular but smooth respiration; a few distant creaking râles towards the sternum. Physical exploration of chest, December 13, same as above, with the exception of no râles being present. The cough continued at night until about the 1st of February, but with little or no expectoration. He continued to receive iodine injections of $\frac{1}{8}$ grain twice a week up to February 2, since which time he has had no treatment; he appears perfectly well, with no cough, and attending to his duties every day.

CASE VI.—A. McL., aged 22; Canadian; single; hygienic surroundings good; habits good; school-teacher.

Family history good. Father died of pneumonia at 57 years of age. She has always been well until attacked with "la grippe" last winter, when she was ill in bed three days with high fever, headache, etc.; never had hæmoptysis. Since then she has had continuous cough, with thick, yellowish expectoration and a growing hoarseness of the voice, with more or less pain in swallowing. Improved for a while during the summer, when she was in Ottawa, Canada. Menstruation irregular, and has been growing more so, and scanty. Bowels also irregular for last two months. Chills and fever occasionally, with nocturnal sweating at times. Emaciation has been slow, although sensation of weakness has been progressive.

November 14.—Almost aphonic, breathing rather stridulous; cough short, brassy, and incessant; expectoration thick and yellow, about eight ounces in twenty-four hours; cough also very troublesome at night; some nasal stenosis; temperature 102.2° (8 P.M.), pulse 110, respiration 34; tongue coated; appetite tolerably good, but had difficulty in swallowing food.

Physical Signs.—Examination of sputum showed a few tubercle bacilli; laryngoscopic examination showed swelling of the arytenoids and ventricles, with slight erosion of these, and in other places granular projections; also erosion of the right vocal cord. The glandular tissues of the ventricles seemed to be tumefied. The physical signs showed slight dulness at the upper right lung front and back, bronchial respiration, prolonged expirations, bronchophony; crackling mucous râles in the left infraclavicular region towards the sternum; small area of cavernous respiration and gurgling râles, bronchophony extending to the fourth rib; dulness on percussion over left side behind; no bronchophony.

Treatment consisted in the administration of hypodermic injection of iodine $\frac{1}{6}$ grain, immediately preceded by a four per cent. solution of cocaine every day; inhalation of chlorine water with solution of chloride of sodium with face-shield inhaler (1 ounce of the mixture being used at each sitting, which was given four times daily); 5 grains of acetanilide with 4 minims of fluid extract of gelsemium at night; the administration of 15 minims of syrup of iodide of iron in teaspoonful of compound syrup of hypophosphites three times a day.

Temperature ranged, from this time to November 27, at 101.5° to 102.5° up to the 26th, and the pulse from 98 to 115. Respiration from 32 to 26 to the 21st of November, and from the 21st to the 27th from 19 to 26. From the 26th the temperature steadily declined until the 8th of December, when it rose to 102.5° at 8 P.M., and was 97.5° the following morning.

From November 22 to the 26th insufflation of iodoform were used daily in addition to the other inhalation. The syrup of iodide of iron and hypophosphites were discontinued after November 20, and 5 grains of bone-meal in extract of malt three times daily was given instead.

The laryngeal symptoms gradually declined in severity, and a diminution of swelling and a repair of the eroded spots could be observed with the laryngoscope very easily. The voice began to change for the better about December 1, and continued, although hoarse, to grow in strength. The respiration became easier, so that she could exercise without any difficulty. Coughing grew less, especially at night, from the 30th until the time of her leaving the hospital. Physical signs also improved, so that on December 14 the only râles present were occasional cracklings over the upper right front. The respiration, however, continued to be coarse, and the examination of the sputum on December 3 proved negative. She had occasionally during that time inhalations at night of spirits of chloroform and ether to

allay cough, and applications of oleum terebinth; acetanilide and gelsemium were discontinued on the 21st. After that she had salt baths every second night. The evening temperature continued from 99° to 99.5° up to the time she left the hospital on the 24th of December. Expectoration was at this time very much diminished, and she had regained her strength. On November 29 she complained of watery discharge from the nose, soreness of the eyes, and dryness of the throat, with some diarrhœa, which was supposed to be due to the iodine, and chloride of gold and sodium was substituted after that and used until December 11 in doses of $\frac{1}{10}$ to $\frac{1}{5}$ grain, when copious perspiration, supposed to be due to the gold and sodium salts, led to its discontinuance and substitution of the iodine, $\frac{1}{6}$ grain, which was used continuously until she left the hospital. This hypodermic medication was continued at her home for a few weeks, and at the last report from her, the early part of this month, she was perfectly well and had resumed her duties, but was still hoarse, and had now no abnormal temperature at night.

Case VII.—Grace, M. C., aged 16; height, five feet four inches; weight, one hundred and twenty-eight pounds; native of Michigan; resides in a village; good hygienic surroundings; attended school until the 1st of January, 1890.

Family history of parents good. Patient has one sister and one brother younger, and one brother older, living. Lost one sister, aged 20, of pneumonia (?). Lived in the house with this sister, but was not near her much. She has been well until last July, at the time of the death of her sister, when she began to cough, having chills, fever, etc. Had hæmoptysis. Grew better from this attack, and had become nearly well until three weeks ago, when she took cold and has been quite ill since; has chills, fever, coughing, nocturnal sweating, etc.

November 12.—Anæmic appearance; thin; pulse 120, small; temperature 100.4°, respiration 30; skin clammy; considerable cough and much expectoration of grayish tenacious sputum; bowels regular, poor appetite, no dyspepsia; sleeps well, excepting for cough; menstruation regular, but scanty; no extra discharge from the nose or stenosis.

Physical Signs.—Laryngoscopic examination shows hyperæmia of the larynx and increased mucous secretion; not much swelling; voice good; chest movements rhythmical; percussion dull over lower right back.

Auscultation. — Paddle-wheel respiration, both upper fronts increased fremitus; exaggerated resonance over right lung; loss of respiratory murmur over right back; diastolic cardiac murmur near sternum and the second costal cartilage. Examination of the sputum showed tubercle bacilli; amount of expectoration has been about six ounces daily.

Treatment.—Chlorine inhalation in inhaling-room twice daily. Five grains of bone-meal in malt extract three times daily before eating; hypodermic injection of iodine, $\frac{1}{12}$ grain, daily. Temperature ranged from 99° to 101° up to the 29th, and the pulse from 100 to 120, excepting on the morning of the 26th, when it was noted at 80; respiration ranged from 20 to 26. During this time the inhalations were increased from twice to three times daily until the 24th, when she complained of some irritation of the throat from them, and they were diminished to two daily. The hypodermic injections were continued at $\frac{1}{12}$ grain, without any symptoms of iodism, until November 22, when the gold and sodium chloride was used alternately with the iodine every other day. The cough and expectoration was lessened, and from November 27 to the time of her departure from the hospital she did not cough at night at all. Expectoration diminished until the 30th, when upon measurement it was found to be one and one-half ounces in twenty-four hours. She left for her home December 18, with very little cough. December 2 and 17 the sputum did not show bacilli. Appetite good, bowels regular. Advised to take occasionally phosphate of sodium as a laxative. Treatment was continued by her physician, Dr. Johnson, for a short time after her return home. He reported on March 11 that she felt well and appeared strong, scarcely any cough or expectoration, but that he found a few bacilli in the sputum. The physical signs December 15 showed dulness on percussion and noisy respiration over upper right front and weakness of respiration murmur over right back; no râles.

Case VIII.—A. S., aged 40; Canadian; occupation, farmer for last ten years, previous seven years stone-cutter; married; has five healthy children; resides on lake shore in a salubrious situation; uses a good deal of tobacco; takes whiskey and beer frequently.

Family history good. Previous history: He has been well, although subject to taking cold and having attacks of dyspepsia; had ague some time ago. Been coughing for fifteen years more or less in the winter, which cough would leave in warm weather. Never had

hæmoptysis, although has expectorated bloody mucus. Has generally expectorated a great deal of yellowish-green, thick sputum. Never had fever and chills until of late. Had been feeling weaker lately and short of breath for the last year. Has noticed slight emaciation. Appetite poor for the last six months. Not been able to work since the 1st of September, since which time he has had chills and fever almost daily, with pain in the chest and increased breathlessness.

October 23.—Temperature 99.6°, pulse 80, respiration 22. Estimated expectoration, nearly a pint in a day; expectoration contains tubercle bacilli. Voice good; no soreness of the throat. Continual pain in the chest and feeling of constriction, especially after slight exercise. Appetite poor; bowels constipated; tongue coated; skin dry.

Physical Signs.—Laryngoscopic examination showed no change excepting abnormal amount of secretion in larynx. No dulness on percussion on either side; prolonged and jerky expectoration on both upper fronts and over right back. Broncho-vesicular respiration pronounced over right back and just outside of the angle of the scapula on right side, with cavernous respiration and large mucous râles over an area about the size of a turkey-egg.

Treatment.—Lugol's solution with iodine, 5 minims, in extract of malt just before each meal, and the spray of eucalyptol once daily and one ounce of the mixture of chloride of sodium and water, equal parts, three times a day. One drachm of Rochelle salts in a glass of hot water every other morning if necessary, and inhalation from cone inhaler at night with chloroform and ether.

The temperature kept up until October 29, when the morning temperature began to go down to 96.5° and 97°, with a feeling of chilliness. He was given, on the 30th and 31st, hypodermic injections of 6 grains of bisulphate of quinine. On the 31st of October the injection of eucalyptol was discontinued, on account of a slight soreness of the throat; inhalation of one ounce of bichloride of mercury solution, 1 to 3000, was given three times a day, with the face-shield inhaler, for three days, when the chlorine-water inhalation was resumed. Temperature range remained from 98.5° to 99.5° until the 10th, when the evening temperature ran up to 100.5° and the pulse to 98, with no sign of chilliness, however, and no sweating. He is now showing some signs of iodism by increased discharge from the nose, which, however, passed off in a day or so. He now receives hypodermic injections every day, $\frac{1}{8}$ grain gold and sodium chloride, from which time up to the 16th of November temperature never rose above 99.2°. His appetite has now improved; expectoration diminished more than one-half; he felt much stronger; though still short of breath, he could breathe much better. From the 10th to the 16th he was also placed in the pneumatic cabinet once daily for four minutes, during which time the pressure was diminished two inches. On the 16th he was obliged to leave the hospital for home. Hypodermic injections were kept up for a short time. He reported in February as feeling very much better, with very much less cough, especially at night, and very much less expectoration. On the 14th physical exploration of the chest showed evidence of emphysema, but at the region of the right shoulder-blade the large mucous râles have entirely disappeared, and nothing but low-pitched cavernous respiration mark the seat of the breaking down of the lung tissue.

Case IX.—M. M.; aged 22; native of Canada; printer; single; lives in a cottage in the city, unpaved and shady street; habits good.

Family history good. Has been feeling ill for about eighteen months with dry cough. Pain both sides of chest. Expectoration of yellowish-white, thick sputum, streaked with blood occasionally. Never had any regular hœmoptysis. Had sweating at night lately, although after a coughing spell on first going to bed sleeps very well. Appetite has been capricious and bowels irregular, sometimes constipated, sometimes loose. Has felt sense of growing weakness, being short of breath for the last four months.

December 6.—Transferred from the outpatient department to the hospital. Pale, somewhat emaciated; pulse, 110, small; temperature 100.5°; respiration 40; skin clammy; tongue coated; complains of dull erratic pains both sides of chest. Feels quite weak most of the time; inclined to lie down. Coughs considerably, especially in the evening and morning. Expectorates about half a pint a day by estimation; sputum contains tubercle bacilli. Voice good; no pain on swallowing, no soreness of the throat; no extra discharge from the nose or stenosis. Has not been in any way associated with anybody who had phthisis of the lungs.

Physical Signs.—Dulness on percussion over the upper half of right lung; bronchophony; broncho-vesicular respiration with prolonged expiration and increased fremitus over this re-

gion. Large mucous râles and mucous creaking over the right infraclavicular region. At the upper left, creaking respiration with abnormal transmission of heart-sounds; bronchoversicular respiration over rest of the lung.

Treatment.—Inhalation of chlorine gas with chloride of sodium twice a day. Hypodermic injection of gold and sodium chloride, $\frac{1}{60}$ grain, every day, increasing daily to $\frac{1}{8}$ grain, which was reached on the 10th, when it was stopped and resumed again on the 12th in doses of $\frac{1}{20}$ grain, with orders to increase to $\frac{1}{10}$ after the next day, at which time he had profuse sweating, nausea, with dilatation of pupils and vertigo, when the hypodermic injection was stopped. Compound tincture of cinchona, with 5 grains of bone, was given three times a day.

The temperature range was from 97.5° in the morning to 100.5°, 101°, up to December 16. On the evenings of December 8 and 9, however, temperature went up to 102.5° and 101.5°, respectively. Respiration from December 11 to 15 ranged between 29 and 40. He had chills followed by some fever from the 8th to the 14th daily. Nocturnal sweating continued more or less until the second of January. The temperature from December 30 to January 11 ranged between 98° in the morning to 101° in the evening. Respiration varied from 24 to 36. Pulse, however, became less frequent, ranging between 76 and 86. On December 6 he began having hectic fever daily, and on the 7th, 8th, and 9th hypodermic injections of bisulphate of quinine were given, with apparently no effect. He coughed very much at night up to December 9, when cough and expectoration somewhat decreased, the bulk of expectoration growing gradually less. He seemed to hold his strength about the same.

The physical signs showed no improvement, and on the 11th of January there were mucous râles, with increased area of bronchophony over both right and left lung. He left the hospital on January 14, and was feeling stronger and better generally, but there were still numerous tubercle bacilli in his sputum, and the lungs did not seem to clear up. The treatment was not kept up since he left the hospital, and we have heard he is gradually failing.

Case X.—B. J., aged 17; Canadian; doing housework; single; hygienic surroundings tolerably good, though living in a cottage; good habits.

Family history good. Father died of Bright's disease. She has been ill since last Christmas, at which time she caught cold, with cough, expectoration, headache. Coughed and expectorated mostly in the morning. Expectoration yellowish in character. This has been increasing until last month, when she has felt very weak, and suffered considerably with fever and chills. Appetite has been tolerably good; pulse regular; menstruation regular until the last two months, when they were absent. She has not slept well of late at nights. Says she had pleurisy on the left side for two weeks. Never had hæmoptysis; not sweating lately; vomiting and diarrhœa frequently.

December 24.—Appearance healthy; cheeks rosy, not emaciated; respiration 38, pulse 108, temperature 101°; coughs and expectorates a great deal. Expectoration contains much caseous matter and tubercle bacilli.

Physical Signs.—Gurgling and large mucous râles; pectoriloquy over the upper left front and back down to the fourth rib, showing a large cavity in this situation. Bronchophony; bronchial respiration; dulness on percussion over the left front and back; bronchial respiration, but no râles, over the right front and back.

Treatment.—Chlorine inhalation; chloride of sodium twice a day; hypodermic injections of iodine, $\frac{1}{8}$ grain, daily; salicin and malt mixture three times a day before eating; beer and whiskey to drink three times a day; 5 grains of acetanilide every night.

Temperature ranged ftom 97° in the morning to 103° most of the time until December 3, from which time there was a gradual diminution until the 22d, when copious diarrhœa with intestinal pain began, which became practically uncontrollable. During this time the temperature ranged from 99° to 103.5° to 104.5° up to the time she left the hospital, which was February 2.

The hypodermic injections were carried up to 1 grain, which seemed to produce abundant mucous expectoration, aching of the limbs, and increased temperature, and it was changed on the 28th for chloride of gold and sodium, which was used alternately with bisulphate of quinine hypodermically. The chlorine inhalations were kept up until the 9th of January, when they were stopped on account of causing excessive pain in the chest. The examination of sputum on January 5 showed a diminution of bacilli, but some blood. Diarrhœa began about the 18th of January, and continued more or less unabated, notwithstanding the administration of strong astringents. During this time Mosquera's food, meat, and stimulants were freely used, but apparently with no effect.

The physical signs showed a progressive breaking down of the left lung until the time she left the hospital. Gurgling râles, cavernous respiration, and pectoriloquy could be heard almost everywhere over the left side of the chest, while the right side of the chest showed large mucous râles and bronchial respiration and bronchophony throughout the whole upper third. She died at her home on February 12. No post-mortem examination was held.

This case is remarkable for the rapidity of its progression, although undoubtedly more than one-third of the right lung was consolidated at the time of her entrance to the hospital; still the treatment seemed to have no effect whatever in stemming the progress of the disease, although the diminution of tubercle bacilli during the time she was having the chlorine-gas inhalations frequently would indicate a marked result from that form of application.

Case XI.—T. G., aged 40; American; occupation, barber; widower; hygienic surroundings and habits good.

Family history good. He was a soldier in the Union army. Says he has never been very well since. No particular complaint until four years ago, when he began feeling debilitated. Says he has been quite ill for two years with occasional chills and fever, debility, and slight hacking cough. During the past year the cough and expectoration has increased, especially during the winter. Says he had "la grippe," since which time he has been much worse; and last winter had an attack of hæmoptysis, about half a pint having been expectorated; four weeks ago another (about one ounce in quantity), and two weeks ago still another attack (about one ounce). Has had more or less indigestion and diarrhœa for the past eight months. Does not sleep well. Last winter lived in California, but last summer, and up to the time of coming to Harper Hospital, lived in Texas. Appetite has been capricious.

January 12, 1891.—Condition: Tongue cracked and red; mucous membrane of mouth injected, with sensation of dryness; voice good; complains of slight soreness of throat; sputum tenacious, yellowish-gray color; says he cannot sleep on account of cough; bowels loose (three to five stools per day); tenderness and flatness of abdomen. Patient is very much emaciated, and unable to walk more than a few yards. Temperature 100.2° on evening of January 12, pulse 80, respiration about 28.

Examination of sputum, made both January 13 and 15, showed presence of tubercle bacilli. Presence of cavity, shown by pectoriloquy, and cavernous respiration, with dulness on percussion over right infraclavicular and supraclavicular regions. Over left supraclavicular and infraclavicular regions, broncho-vesicular respiration and a few moist râles. Over left infrascapular region there was broncho-vesicular respiration, but no râles. Over right scapular region there were moist râles, bronchophony, and exaggerated murmur.

Treatment.—Injections of iodine $\frac{1}{24}$ grain, gradually increased each day; inhalations of chlorine gas twice daily; pepsine before each meal; Squibb's diarrhœa mixture three times daily after meals; Mosquera's food, one drachm in boiled milk, every four hours. The injection was increased until the dose of iodine reached $\frac{1}{3}$ grain on the 22d, when, symptoms of coryza, dryness of throat, and scantiness of urine coming on, it was substituted by $\frac{1}{4}$ grain of chloride of gold and sodium every night until the 26th; after this $\frac{1}{2}$ grain of iodine and $\frac{1}{8}$ grain of gold and sodium were given on alternate nights. On the 16th and 20th, half an hour after the injection, the temperature rose to 101.5°. On the 25th and 26th, there being nausea and vomiting after inhalation of chlorine, they were stopped for two days, and then resumed. The temperature steadily decreased, excepting from the 16th to the 21st, when the evening temperature was 99.2° and the morning 98°. On the morning of the 24th he had a slight chill, the temperature afterwards reaching 100°. On the 25th, 26th, 27th, and 28th, chilliness each morning, with evening rise from 99.5° to 100°. On the evening of February 5 the temperature rose to 100.5° after an injection of iodine. It also rose on the 7th after an injection. From this time on he rereived the inhalations of chlorine but once daily. From January 5 to February 9 there was a steady decrease of temperature, as well as pulse and respiration rate. From the 14th of February the temperature was never above 99° in the evening, and 98° to 98.5° in the morning, with two exceptions,—viz., on March 5 and 7, respectively, the temperature rose to 100° in the evening, accompanied by slight diarrhœa. A hypodermic injection of bisulphate of quinine was given on the morning of the 7th. From that time the temperature varied from 98° in the morning to 99° and 99.5° in the evening. He had regained much strength, weighed eight pounds more, and could walk about very well. He had very little cough,—in the morning only,—and he expectorated but about two drachms, while the sputum showed no tubercle bacilli.

Physical exploration of the chest at this time showed no moist râles; but creaking coarse respiration over the region of former lesions.

CASE XII.—Miss T. F., aged 21; American; single; has had good hygienic surroundings of late; has been doing housework for the past twelve months. The year previous was clerk in an office.

No tuberculous family history, but father, paternal grandmother, paternal grandfather, and maternal aunt died of cancer, all at advanced ages. She was generally well until last winter, when she was attacked with "la grippe," and was confined to bed four days and disabled for three weeks, suffering from severe cough. In April she became nervous or hysterical, but recovered from this in a few weeks, and resumed work, working hard for about five weeks. In July she was taken sick with *supposed* peritonitis, from which she slowly recovered, and was then "taken down" with so-called "mountain fever," after which she never seemed to have regained her strength. About four weeks ago she began coughing much, and expectorating greenish or yellowish tenacious sputum. She had not menstruated for three months. Her appetite was at first capricious, then almost absent; bowels alternately constipated and loose; sleep very much disturbed by coughing and sweating. She has been growing very weak and emaciated; has considerable pain in chest; never had hæmoptysis.

November 17, 1890.—Condition, weak, pale, emaciated, and able to sit up but for a short time each day; bowels constipated; anorexia; nausea; tongue coated, with red edges; respiration 40, pulse 90, temperature 103.5° (P.M.); has considerable pain through left side of chest and over right hypochondriac region, the abdomen being rather full and tympanitic; considerable cough with abundant expectoration of tenacious yellowish or grayish sputum, teeming with tubercle bacilli.

Physical exploration of chest showed dulness on percussion over whole left chest behind, and upper part of right front; bronchial respiration over upper right, and whole of left side; large mucous râles, and moist crepitation over lower left, behind, left apex, and upper right front; abnormal transmission of heart-sounds and increased fremitus. At right axillary region and at left infrascapular region, gurgling râles and cavernous respiration, with marked bronchophony, and whispering pectoriloquy over a small space of the left mammary region; slight swelling (œdema) of feet.

Treatment.—Hypodermic injections of iodine 1/6 grain, gradually increased to 1/2 grain; inhalations of chlorine once daily. From 17th to 24th, morning temperature ranged from 98.5° to 99.5°, and evening temperature from 103° to 104.5°. Respiration ranged during this time from 25 to 35, pulse from 90 to 120. On the 23d, at 9.30 A.M., the temperature went down to 97.5°, and rose at midnight to 104.5°. From this time to the 29th the temperature ranged from 98° in the morning to 100° and 101° in the evening. On the morning of the 29th a severe chill, followed by a rise to 104° at 6 P.M. A hypodermic injection of iodine, 1 grain, was given at 6.30 P.M., and from this time to the 5th of December the afternoon temperature did not go above 101°. The iodine was substituted, on the 5th, by chloride of gold and sodium on account of acne appearing. Nocturnal perspiration was excessive most of the time during this period and was controlled by atropia or agarcine. From this time to the 15th the evening temperature ranged at about 101.5°; occasionally 102°. Morning temperature went below 98.5° only three times. Acetanilide was given in the evening whenever the temperature rose above 101°. The respiration gradually diminished up to the 15th, ranging between 24 and 30. Bowels during this time were more or less constipated; tenderness of abdomen kept up more or less of the time; also pain in chest, sometimes severe. After the 15th, hypodermic injections of iodine and chloride of gold were used alternately until the 23d. The inhalations of chlorine were given every other day. Hypodermic injections of bisulphate of quinine were given on the 15th, 17th, and 19th: they seemed to shorten the hectic fever very much. During this time the expectoration was very profuse, containing much pus, also bacilli. From the 14th to the 29th the pulse fluctuated from 90 to 126 and 130. Temperature was also very irregular, and so continued up to January 1. On December 24 and 30 it reached 105°, the following morning going down to 97°, and accompanied by a chill and nausea; respiration was quite regular, ranging from 20 to 26; nausea, and excessive diaphoresis frequent. From the 26th to the 31st she suffered from copious diarrhœa, followed by increased œdema of the feet and great debility. Injections of chloride of gold and sodium were suspended during this period. On January 1 hypodermic injections of gold were resumed, 1/6 grain being given night and morning up to the 6th. On account of vertigo, nausea, and sense of constriction of body, they were again

suspended. From January 1 to 7 the morning and evening temperature steadily decreased, ranging from about 98.5° to 100°. On the morning of the 7th she had a marked chill, the temperature rising to 104°; after this, expectoration was more copious and yellowish in color; pulse still feeble, ranging from 90 to 110. From the 7th to the 31st she continued to feel much better, the œdema of feet had increased, and there was ascites. Bowels remained somewhat loose; appetite increased. She was given bone-meal and malt ale through December and January with Mosquera's food; was given codeine at night, when necessary, and each hypodermic was preceded by one of cocaine. She steadily progressed without relapses until February 1, when the temperature rose again, expectoration increased, and was accompanied by pain in the chest. On February 7 she again began to improve; on the 13th and 18th she had a high rise of temperature. Ferri carbonate was now added to the bone-meal, on account of the anæmia. Patient was now having one passage of the bowels daily. Coughing had very much diminished, being present in the morning only. Sputum still contained tubercle bacilli. She grew stronger during February, with dropsy disappearing, but the temperature still kept up. Pulse, although frequent, ranging from 90 to 100, was growing in tension. From March 8 improvement still was more rapid. Bowels regular; œdema and ascites gone; appetite voracious; cough almost disappeared, and expectoration amounting to but little more than one drachm daily, of glairy mucous character. Temperature has been steadily decreasing since, and from March 4 to 23 the evening temperature has been about 99.5° to 100° every third or fourth day. Since March 23 it has lowered some, and since the 25th has never been above 99.5°; pulse still frequent but gaining in tension; respiration 20 to 25. Since March 10th she has been walking about the corridors and ward, and says she feels "perfectly well." Sputum on March 20 still showed a few tubercle bacilli.

Physical signs on February 15 showed scarcity of moist râles, and a decided diminution of areas of bronchial respiration with some dry râles. On March 10 no râles excepting dry (creaking and sibilant) in different parts of chest; is rather asthmatic; respiratory murmur, however, was still hoarse. At this writing, March 26, there seems a very good prospect of recovery, she having had no serious relapses for some time. This case seems remarkable, as it had been diagnosed as general tuberculosis by several physicians, and when she entered the hospital no one of the members of the staff who saw her entertained any hope of her recovery. She will leave for her home in the central part of the State in about one week. Menstruation has never recurred. She is now taking bone-meal, with carbonate of iron three times daily, and hypodermic injections once a week. No inhalation of chlorine has been given since March 1, excepting what is diffused in the atmosphere of the ward four times every day.

Case XIII.—Fred. V., aged 28; farmer; married, damp surroundings; poor circumstances.

Family history good. He was never fleshy. Was tolerably well until three years ago, when he began coughing, and has coughed and expectorated ever since, more or less, for the last six months; has had fever and chills, nocturnal sweating, and is losing weight; also micturates frequently; expectoration streaked with blood occasionally, but has never had hæmoptysis. He has never been exposed to pthisical patients.

December 31.—Transferred from out-door department of Harper Hospital. Appearance pale and thin; respiration 32, pulse 86, temperature 101.5°; skin moist; bowels regular; appetite poor; shortness of breath on slight exertion; erratic pain in chest and abdomen; tubercle bacilli in sputum; urine contained oxalates.

Physical Signs.—Chest small; movement short and rapid; respiratory movement diminished; percussion sound high pitched over right side; increased fremitus; bronchial respiration; bronchophony; mucous click and subcrepitant râles over upper right front and back; increased fremitus and bronchial respiration; bronchophony over upper left chest. Laryngeal examination showed very slight œdema of larynx.

Treatment.—Hypodermic injections of iodine, $\frac{1}{12}$ grain, every evening, increasing to ½ grain; chlorine inhalations (two drachms of chloride of lime) twice a day; dilute hydrochloric acid, 10 minims, three times a day before eating; linimentum olei tiglii et olivæ to chest. From December 31 to January 14, temperature ranged from 98° to 98.5° in the morning, and 101° to 101.5° in the evening, reaching 102° on the 7th, 8th, and 10th, after injections of ½ grain iodine on the 7th and 8th. Pulse 108; respiration ranged from 20 to 30 and 34. On the 10th he had pain in the abdomen and was restless; also had diarrhœa, having four stools in the day and two at night, and a watery discharge from the nose. Ex-

pectorates very much, increasing up to the 9th, when it began to decrease. On account of nausea following chlorine inhalations, they were first diminished, then discontinued from the 14th to the 18th, and were then resumed and a smaller quantity of the gas evolved. Hypodermic injections continued on the 18th at ⅙ grain; on the 20th severe nausea and vomiting occurred, and 1 drachm of Hoffman's anodyne was given every night for a few nights; temperature ranged, from the 15th of January to the 10th of February, from 98.5° in the morning to 99.5° in the evening, excepting on the 26th, 27th, and 28th, when it reached 101°; there was very little night-sweating at this period.

Physical examination on the 11th of January showed bronchial respiration, with no râles except on forced inspiration on the 9th of February.

Auscultation showed still more clearing, but with some slight moist crackling over left clavicular region. On the 25th of January the hydrochloric acid was discontinued, and a tablespoonful of malt ale (Parke, Davis & Co.'s) three times a day was given. He is still increasing in strength and has much less expectoration, and the stomach is less irritable. (Received this latter report from his physician March 20, 1891.)

Case XIV.—Bernard R., aged 63; German; married; occupation, farmer; hygienic surroundings fair; has been in the habit of drinking considerable beer.

Family history good. He has had cough since April, 1890; expectorates considerably, especially in the morning; is growing weaker; having lost thirty pounds in the last four months; has a very poor appetite, sleeps tolerably well, and has no dyspepsia or diarrhœa; "sore throat," especially at night, and hoarseness.

December 30, 1890.—Physical examination of chest showed respiratory movement diminished. Over whole left front and back, prolonged expiration, diminished vocal fremitus; paddle-wheel respiration, heard at the left lower back; broncho-vesicular respiration over the right front. Laryngoscopic examination showed hyperæmia of pharynx and upper larynx, with swelling of arytenoids and epiglottis. Respiration 24, pulse 90, temperature 90°; sputum contained tubercle bacilli.

Treatment.—Inhalations of chlorine from a face-shield inhaler twice daily. January 4, began hypodermic injections of $\frac{1}{12}$ grain iodine every day, and bone-meal with malt ale given three times a day. Temperature ranged from 99° to 100° in the morning, and from 102° to 102.5° in the evening, up to January 10; pulse was for a while from 60 to 80; respiration from 20 to 32. The general symptoms grew better; respiration clearer. Temperature ranged from 98.5° in the morning to 99.5° in the evening right along. The dose of iodine was increased to ⅓ grain, which, however, produced eruptions and coryza, with increased soreness of throat, and this dose was therefore diminished. The soreness of throat continued, although the laryngeal swelling and expectoration had greatly diminished. He took the chlorine inhalation very well throughout, and from January 3 to January 12 had at evening a spray of a four per cent. solution of cocaine. He left the hospital January 15, very much stronger, with less cough and expectoration, but with the sputum still showing the presence of a few tubercle bacilli; he was also still somewhat hoarse. He returned February 7, 1891, somewhat worse, having taken a severe cold from being exposed to a storm. His temperature was 99°, and his throat much worse. From February 7 to 16 the temperature ranged from 99° to 99.3°. On the 15th and 17th it was 100.5° and 101°; the latter rise was probably due to the hypodermic injection of ½ grain of iodine. He complained of more soreness of throat from the 7th to the 20th. Laryngeal examination showed the larynx to be more hyperæmic and swollen, but showed no ulceration. He took daily two inhalations of chlorine water and solution of salt from the face-shield inhaler. He received hypodermic injections daily of ⅙ grain of iodine from the 17th on.

The temperature gradually grew lower and more even, ranging from 98.5° to 99°, excepting on the evening of the 3d and 4th of March, when he received some depressing news from his home. He left the hospital on March 6, feeling much better, but still complaining of a little soreness of throat. The hypodermic treatment, but not the chlorine inhaler, has been kept up at his home. At the last account, March 20, he was still improving, although temperature was not normal.

Case XV.—Mrs. M. B., aged 25; American; married; occupation housewife. She had "la grippe" last winter, and has coughed considerably ever since, expectorating a thick, yellowish sputum. Has been worse the last ten weeks. Has complained of pain in the feet for eight weeks, amounting to neuralgia. Appetite good; has constipation; does not sleep well.

Family History.—A sister, aged 21, died of

consumption last summer. Father died of inflammation of the lungs, aged 53. Otherwise, family history is good. Menstruation regular, excepting for the last two months.

November 29.—Condition: Not able to be out of bed much. Temperature, 101.2° in the evening, 99.6° in the morning; pulse 100, respiration 26.

Physical Signs.—December 14, bronchial respiration and bronchophony; moist râles over left supraclavicular mammary and axillary region, and over left back, also coarse respiration over whole right lung; analysis of urine showed no albumen casts nor sugar, but pus corpuscles, bile pigment, and mucus; color light and transparent. Examination of sputum, after staining, showed numerous tubercle bacilli; copious perspiration, distressing pain in feet, and cough.

Treatment.—December 1, ammonium iodide, 5 grains, with syrup of tolu, four times daily, was prescribed for cough. On December 10 the patient was removed to phthisis ward, and on December 12, hypodermic injection of iodine (1/6 grain) and atropia sulph. ($\frac{1}{100}$ grain) was ordered every night. From time of entrance, morphia sulph. had to be frequently given for pain and restlessness. On December 13 the injection of iodine was increased to 1/3 grain. On December 19 the temperature went up to 104.2°; pulse 122. She complained of severe pain in right side of chest. On December 20 an injection of gold and sodium chloride ($\frac{1}{10}$ grain) was ordered in place of the iodine. On January 15 1/8 grain every day was ordered. Patient continued to be more or less troubled with pain in right side of chest and in the feet. On January 14 he had a severe chill and a hypodermic injection of bisulphate of quinine was ordered. On January 2 extract of malt (2 drachms), spiritus frumenti (2 drachms), and bone-meal (3 grains) was ordered three times daily. On January 19, 3 grains of salicylate of cinchonidia, three times daily, was ordered, and all other medication stopped. On January 21 she had slight hæmoptysis. January 26 (A.M.), temperature rose to 102.8°, and on January 27, a hypodermic injection of gold, $\frac{1}{10}$ grain, every two days; then 1/3 grain. On the morning of February 6 her temperature was down to 98° On February 8 she complained of soreness of throat, and oil of eucalyptol, two drachms three times daily, after meals, was given by inhalation, and a hypodermic of iodine, 1/2 grain every other day up to February 15, when the hypodermic injections were discontinued for three days on account of diarrhœa. On March 5 a menthol spray (two per cent.) was ordered three times daily for increased odynphagia. Temperature range continued most of the time from 100° to 102°. On February 15 (8 P.M.) it rose to 103.2°; the next morning it went down to 99.2°, then continued from about 101° to 102° until February 25 (A.M.), when it rose to 103°, followed by profuse sweating. March 4 (P.M.) it rose to 103.2°. The temperature also ranged high on March 14 and 15 (P.M.). An examination of sputum on December 18, after staining, showed many tubercle bacilli. On January 19 the character of the sputum changed for the better, showing fewer bacilli. On February 9 and 17 there were still fewer bacilli. On March 5 the bacilli were present in the sputum, but very scarce. Her throat was very sore, the epiglottis, arytenoids, and ventric bands being ulcerated. Her pulse was very weak. She was scarcely able to expectorate, and had great tenderness of the abdomen, and diarrhœa. The skin was constanlty wet, and mouth sore and hot. The emaciation was extreme. During January she seemed to improve very much, cough and expectoration diminished, and she improved in appetite and strength, but from the middle of February on she progressively declined. The laryngeal symptoms came on late. She died March 17. The autopsy revealed tubercular nodules throughout both lungs, in intestines, mesenteric glands, and larynx, with numerous excavations in left lung and fewer in right. There was, however, a notable dryness to the pulmonary tissues. Later on we shall publish fuller details of the morbid anatomy of this and two other fatal cases.

CASE XVI.—F. D. H., aged 36; American; married; had one child; hygienic surroundings excellent; habits good, except that he has used morphine rather freely, sometimes one grain daily for the last three months; occupation, stock-dealer; hard worker; been compelled to give up work entirely for the last two months.

Family History.—Lost two paternal uncles and one aunt from phthisis, and one brother from the same disease. Two half-sisters of his mother also died with phthisis.

Previous History. — Patient never very strong. Between the age of 15 and 17 had four copious hemorrhages from the lungs, but was not much confined to bed until two years ago. Has had frequent hæmoptysis since then, varying in amount from one or two ounces to a pint. Says he has had slight cough since 15 years of age, which has grown much worse lately. Since having had "la grippe," last

winter, has been still worse, with frequent night-sweats. During the past year has had ten or twelve superficial ulcers on the legs, which discharged a week or two before healing; no specific history. Appetite and digestion poor; has not been able to digest milk, oils, or fatty meats; constipated most of the time. Does not sleep well; has more or less pain in chest, and more or less shortness of breath, at times amounting to dyspnœa.

January 29, 1891.—Condition: Very much emaciated; tongue coated; panting respiration; very weak, cannot walk much; skin moist; rather anxious expression of countenance. Respiration 28, pulse 100, temperature 99° (A.M.). Considerable cough, but not a great deal of expectoration. Examination of sputum showed no tubercle bacilli. Urine rather scanty, shows presence of albumen and pus.

Physical Signs.—Bronchial respiration, bronchophony, and prolonged expiration over the left apex, with mucous and sibilant râles all over the supraclavicular and axillary regions; bronchial respiration and mucous and sibilant râles over the left infraclavicular and mammary region and over the left back. There were also dry, creaking râles, prolonged and jerky expiration over upper right front, with coarse respiration behind. Percussion resonance was generally duller all over the chest.

Treatment.—On the night of January 29, owing to pain and dyspnœa, a hypodermic of morphine, ½ grain, was given, followed by $\frac{1}{10}$ grain of iodine. Hypodermic injections of iodine were continued daily, and gradually increased until February 7, when ½ grain was given. This was repeated on the 8th and 9th, when cutaneous eruptions, coryza, and profuse watery expectoration, with dryness of throat, supervened, and it was diminished to $\frac{1}{10}$ grain. A few days later it was increased to $\frac{1}{6}$ grain again, and so continued up to the time of his departure. On account of shallow chest expansion, the cabinet treatment was commenced on February 6, at first, once daily for two minutes, with two inches diminution of pressure, and gradually increased to two sittings daily, of four to five minutes each, with a diminution of three to four inches pressure. Temperature ranged between 98° and 100.5° (P.M.) up to February 2, at which time the evening temperature rose to 99°, and on the following day returned to 98.5°. This range of temperature contined, excepting on the 7th and 16th, when it rose to 100° and 100.5°, respectively. On the 16th he suffered considerably from dyspnœa, presenting the clinical appearance of asthma. This asthmatic character continued more or less of the time until his departure, March 9. He had slight hæmoptysis half an hour after leaving the cabinet on February 16. On February 9 physical exploration of the chest showed disappearance of moist râles over the left chest, but dry, crackling râles over left upper front and back, with creaking and jerky respiration over upper right front. Physical exploration on February 16 showed sibilant râles, generally over the left lung, and over upper right front. The pulse ranged between 80 and 100 after February 9, increasing to 110 on the 18th, after a long walk for him. When he left the hospital, March 9, he had gained about eight pounds. His general strength, he said, was better than for two years. He was able to walk half a mile easily, his appetite improved, and his digestion was very much better. He had received no anodyne medication excepting on two or three occasions, and no stimulants except malt ale (Parke, Davis & Co.'s) three times daily. His nourishment for the first two weeks consisted of beef-tea, meat-balls, Mosquera's food, and eggs. The only internal medication he received was 5 grains of bone-meal three times daily, excepting, February 9, 10, 16, and 17, a few doses of salicylate of cinchonidia. At no time were tubercle bacilli discovered in his sputum. No inhalations were given until February 18, from which time inhalations of chlorine were given daily.

This was undoubtedly a case of so-called chronic catarrhal pneumonia. We have heard since his return home that he is still improving. He receives one hypodermic injection a week of $\frac{1}{6}$ grain of iodine.

CASE XVII.—K. C., aged 32; Canadian; married; mother of five children; hygienic surroundings have been good; habits good; occupation, housewife.

Family history good. She had "la grippe," she says, last winter, and has not been well since, although always in "good health before." Has had cough ever since, with expectoration, which lately had become quite free. Had hæmoptysis three months ago, when about one pint of blood was expectorated. Felt better for a while after that. Menstruation ceased five months ago. Appetite good most of the time; has had indigestion at times, and constipation continuously. Has not slept well. Has had considerable pain in left side of the chest, not confined, however, to any particular spot.

January 2, 1891.—Respiration 22, pulse 96, temperature 99.5°; poor appetite; constipated; feels very weak, although able to be

up and about. Examination of sputum shows many tubercle bacilli; cough harassing, with "heavy" expectoration.

Physical exploration of the chest showed no appreciable dulness on percussion; respiratory movement rather panting. Large mucous râles, bronchial respiration, and bronchophony at upper right front and interscapular region. Small mucous râles with prolonged expiration over upper left front. Some dulness on percussion in the lower part of the left axillary region.

Treatment.—Inhalation of chlorine gas twice daily; injection of iodine, ½ grain, every evening; bone-meal and malt-salicine mixture three times a day; bromide of potassium (15 grains) at night if necessary; mustard paste on left side of chest. In the morning, January 3, she had a long chill, temperature going down to 97°. First hypodermic injection given on the evening of January 2.

Temperature ranged from 98.5° in the morning to 98.5° to 99.5° in the evening, with the exception of the 5th, 6th, and 7th, when the evening temperature rose to 100.5°. A rise of temperature seemed to follow each injection, and after the 7th the hypodermic injections were given between 4 and 5.30 P.M. No further chill occurred until the mornings of the 23d and 29th. Upon examination by Dr. Carstens, it was found that the patient was pregnant! On this account the dose of iodine by hypodermic injection was never increased beyond $\frac{1}{12}$ grain. On the 10th she began to have considerable nausea in the morning, for which extract of hyoscyamus and bismuth were given, and Mosquera's food every four hours. Evening temperature gradually dropped to 99°, with the exception of the 23d and 30th, when it ran up to 100.5°. The cough greatly diminished, excepting in the early part of the night, when it was quite troublesome. Expectoration diminished so that when she left the hospital, February 6, she did not expectorate more than one ounce in twenty-four hours. The character changed from heavy muco-pus to a frothy mucous sputum. There was no diarrhœa during her stay in the hospital, and improvement of her general strength was quite marked. She left, February 6, very much improved, and went to her home near Buffalo. Since that time she has been under the care of her physician in Buffalo, who reported a short time ago, however, that she was considerably worse. No symptoms of threatened abortion were manifested while at Harper Hospital. It is evident that in this case pregnancy offered no protecting influence. Had we dared to push the treatment, perhaps better and more durable results might have been obtained.

CASE XVIII.—M. B., aged 28; native of Michigan; dressmaker; single; hygienic surrounding good; thin, but of good color; height, five feet three-quarters of an inch; weight, one hundred and seven pounds. Despondent temperament. She had been working very hard, and late at night, for some months.

Family history good. She has been formerly in good health; three and a half years ago she had an attack of sore throat lasting a week, accompanied by soreness of the neck and some swelling of the cervical glands. After that she began to cough slightly, but without expectoration; has continued to cough winter and summer since, but during the last three months her cough has been accompanied by considerable expectoration of a glairy, mucous character. She has been very nervous, and slept poorly for some time past. Appetite has been growing poorer. Has been having chilly sensations and fever on and off irregularly. Menstruation regular. Last two weeks has had fever most of the time. Has had erratic pains through both sides of the chest, more or less, for the last six months, and some shortness of breath upon exertion, which is growing.

December 8.—Respiration 24, pulse 34, temperature 99°; incessant "tickling cough;" skin dry; tongue clean and reddish; bowels regular; fauces soft, doughy; sputum very offensive, containing tubercle bacilli.

Physical Signs.—She had creaking râles and bronchial respiration over the upper left front and back; larynx rather pale and wet.

Treatment.—Salicine and malt mixture three times a day; Mosquera's food and milk three times a day; bromide of sodium at night (15 grains); spray of thymol twice a day in inhaling-room; oleum terebinth applied to chest every night; hypodermic injections of gold and sodium chloride ($\frac{1}{20}$ grain) every night, gradually increased to $\frac{1}{10}$ grain. On the 16th and 17th she complained of excessive pain in the chest, with sense of constriction; also some nausea and continual sweating day and night. The injection of gold and sodium chloride was reduced to $\frac{1}{80}$ grain, and so continued. Expectoration was never very great. It has now diminished to about one ounce in twenty-four hours. From this time to the 26th the cough was very much diminished. From the 22d to the 31st she went into the cabinet every day with two inches pressure taken off. She complained very much of the hypodermic injec-

tions. They seemed to produce neuralgia of the leg on that side. The evening temperature had been 99° up to the 28th, and on the evening of the 29th was 101°. During the night of the 28th and 29th she had four "loose passages" from the bowels. A hypodermic injection of 6 grains of bisulphate of quinine was given, and on the 30th the temperature was 98.5°, and on the evening of the 31st normal. The temperature continued so up to the time she left the hospital. The thymol spray was substituted on the 14th by chlorine inhalation once a day, which was continued until the 27th, but as it seemed to cause severe coughing afterwards, it was given every second day only.

When she left the hospital, February 20, she was still troubled with tickling cough and a feeling of tightness of chest, but had very little expectoration, in which no tubercle bacilli was found. She was stronger, ate well, and digestion was good, we saw her a week or two afterwards, when she seemed to be still improving. After this she went South to visit a relative, and we have not heard directly from her, but indirectly that she is quite well.

CASE XIX.—N. L., aged 21; American; clerk; single; lives in a village; sanitary surroundings good.

Family history good; habits good. He was very well until two years ago, when he began suffering from hoarseness at night, with slight cough and expectoration. For the last year these symptoms have been growing worse. He never had hæmoptysis; never has been exposed, as far as known, to phthisical patients; has been growing weak generally during the last six months, and has had more or less soreness of the throat, with hoarseness.

September 14.—Looks thin and sallow; pulse 118, temperature 99.5°, respiration 22; considerable cough and expectoration in the morning. Sputum showed no tubercle bacilli. No pain in the chest, no dyspepsia, but "liable to diarrhœa;" no extra discharge from nasal passages; no stenosis. Conscious of fever, especially at night; nocturnal sweating two or three times a week. Laryngoscopic examination shows pharynx reddened, larynx hyperæmic and wet. Not much hoarseness; no odynphagia now.

Physical examination of the chest shows diminished chest movement, percussion resonance good.

Auscultation.—Broncho-vesicular and bronchial respiration in patches over both sides; moist râles at the upper right front, with increased fremitus.

Treatment.—On account of the suspicion of specific infection, he was "put upon" inhalations of biniodide of mercury, 1 to 3000, and was given hypodermic injections of bichloride of mercury, $\frac{1}{20}$ grain, every other day, gradually increasing to $\frac{1}{12}$ grain. This continued until the 30th of September, when, the bowels becoming loose (seven passages daily), this treatment was discontinued, and he was given chlorine inhalations and tannate of quinine (3 grains) internally, every three hours, with 1 grain of pulv. opii at night, until the bowels were checked. He was given a teaspoonful of Mosquera's food and milk alternately every two hours, and insufflation of iodoform to the larynx. Temperature up to this time had ranged from 98° in the morning to 99.5° in the evening. On the 29th the temperature rose to 100.5°; pulse was 110 and feeble. Evacuation of bowels becoming more frequent, the temperature declined, and from the 3d to the 12th the evening temperature was normal, with the exception of the evening of the 8th, when it rose to 100°. This occurred after a hypodermic injection of $\frac{1}{8}$ grain of gold and sodium chloride. The further treatment consisted of the hypodermic injections of gold and sodium chloride, and tannate of quinine and bismuth internally, with inhalations of chlorine water and sodium chloride from face-shield inhaler. On October 2 the odynphagia was increased; also the hyperæmia of the pharynx and upper larynx. Insufflations of iodoform with morphine were given every night up to the 9th, when this condition seemed to abate. The Mosquera food and milk was kept up during the time he was in the hospital, and when he left (October 18) he was very much improved in every way; strength good, etc., temperature had been normal most of the time for the last ten days; cough and expectoration was very much less, and no tubercle bacilli in the sputum. A week or so after leaving the hospital he went South, and seemed to do very well until December, when he contracted what was said to be a remittent fever. From this time on he became rapidly ill, losing flesh and strength; the cough returned, with considerable expectoration, also soreness of throat and loss of voice. He returned to Harper Hospital March 12, where he now is. Expectoration contains tubercle bacilli. His condition on entrance was quite grave; he was very much emaciated; temperature 101°, pulse 110, respiration very rapid (28), with considerable cough and expectoration, diarrhœa, and anorexia; very hoarse, and suffering odynphagia. Examination of the chest shows bronchial respiration and bronchophony in

both upper fronts, with cavernous respiration and gurgling in the left infraclavicular region, demonstrating a softened spot probably the size of a turkey-egg. Examination of the left back shows also a softened spot, as evinced by much gurgling, mucous râles, and pectoriloquy. Laryngeal examination shows no ulceration of larynx, but swelling and hyperæmia. He is now receiving hypodermic injections of iodine, ⅓ grain, taking bone-meal and malt ale every four hours, with liberal soft diet, meat, eggs, etc. He also gets the chlorine inhalations three times daily. It is necessary to give him astringents and anodynes more or less to allay diarrhœa. This case is instructive in showing the danger of relapse when a plan of treatment is stopped too soon.

CASE XX.—N. S. M., aged 22; American; housewife; married; no children; hygienic surroundings always good.

Family History.—Father died of acute phthisis, aged 40; otherwise family history good. She was never very strong or fleshy, but well until three years ago, since which time she has been ill more or less. Has had pain in the back, below the scapula, a great deal. Gradual loss of weight; weakness increasing; is not apt to take cold; has had more or less cough, for the past year and a half accompanied by expectoration of sputum, sometimes frothy, sometimes yellow and heavy. Says she had "la grippe" last winter, and has felt very much worse ever since. Had hæmoptysis last May, losing about four ounces of blood. Stomach has been irritable; suffered from indigestion, with vomiting, especially mornings and evenings. Appetite capricious; bowels irregular, constipated and loose alternately. Menstruation has continued, but of late has been growing scanty. Has not slept well for some months; apprehensive and nervous; has had night-sweats on an average two or three times a week for the last six or eight months. Has not been with anybody suffering from phthisis pulmonalis. Has never consumed much fresh meat or milk.

December 27.—Respiration 30, pulse 90, temperature (P.M.) 102°; skin moist, very white, and soft; tongue furred; bowels move twice a day; nausea now; very weak, unable to walk very far; trembling of the muscles, constant on exertion; erratic pains about the chest; tenderness of the abdomen; slight œdema of the feet.

Physical Signs.—Bronchial respiration, and pectoriloquy over upper right front; cavernous respiration; gurgling mucous râles over upper left front and back; broncho-vesicular respiration over right back; dulness on percussion; resonance of high pitch over the right upper right front and back.

Treatment.—Bone-meal, with malt ale, four times daily; chlorine inhalation (five minutes in inhaling-room) morning and evening; hypodermic injection of gold and sodium chloride, $\frac{1}{10}$ grain, every night; glass of hot water every morning early. On the evening of December 28 the temperature rose to 102.5°, falling to 97° the following morning. After an interval of three days, when the temperature ranged from 99° to 101°, it again rose to 103.2° in the evening, and kept up until about four o'clock in the morning, when a gradual subsidence took place until eight o'clock, when it was 98°. From this time up to January 28 there was a general lessening of "hectic fever," the main rise of temperature taking place at intervals of about three, four, and five days, and from February 1 the temperature gradually diminished until February 12, obtaining a range of 98° to 101.5°. Diarrhœa came on at intervals during the period of her stay in the hospital. The pulse gradually grew more frequent, with some loss of tension. After January 22 until February 14, when she left, her pulse was from 90 to 110. Tenderness of the abdomen seemed to increase, and also œdema, during the last two weeks of her stay in the hospital. After the first three weeks of treatment the expectoration diminished, as also the cough, and there was an improvement in the appetite and digestion, but this soon gave way to exacerbations of fever, diarrhœa, and anorexia. On account of severe neuralgia excited by the hypodermic injections, they were discontinued on January 4 until the 10th, and after that given only every other day. The hypodermic medication with this patient consisted entirely of chloride of gold and sodium. During the first two weeks the injections not only excited neuralgic pains spoken of, but, when $\frac{1}{5}$ grain was given, produced vertigo, nausea, and feeling of constriction about the waist, which lasted from one to three hours. The patient left the hospital for her home February 14, and, according to report, died about March 1. No autopsy was held. Although gaining strength, and apparently improved during the first three weeks of her stay in the hospital, during the last two weeks she seemed to gradually fail. However, when she left she did not show much more weakness than when she entered. This was undoubtedly a case of advanced general tuberculosis. Besides the special treatment, there was, of course, instituted a various range of symptomatic treat-

ment, consisting of the administration of acetanilide, bromides, codeine, pepsin, pancreatin, tannate of quinine, etc. The stimulants used were principally the malt ale of Parke, Davis & Co., eggnog, milk-punch, etc. At no time were the tubercle bacilli absent from the sputum.

One noticeable feature in the treatment of this case was the tonic effect of the gold and sodium, which lasted sometimes for half a day.

CASE XXI.—D. V., aged 11; American; female; domiciliary surroundings damp.

Family history bad. Has one sister suffering from tuberculosis now, and has lost one sister with this disease. She was never a strong child. When a few months old she had so-called congestion of the lungs; has been weak and more or less ill ever since. When six years of age, she had whooping-cough; since that time has coughed more or less. Appetite capricious; more or less fever and chills; persistent diarrhœa, two to four watery movements daily. Considerable cough and expectoration during the cold months of the year.

January 5.—Respiration 40, and panting; pulse 130, temperature 102°; very much emaciated and of waxy appearance; sputum copious, markedly offensive, and contains many tubercle bacilli.

Physical Signs.—Excavation in places over both lungs; gurgling râles, pectoriloquy, and cavernous respiration, marked throughout the left and upper part of the right lung.

Treatment.—Bone-meal, carbonate of iron, of each 3 grains, every four hours; milk-punch four times daily; beef-balls; unguentum iodidi comp. applied to chest every night; hypodermic injections of chloride of gold and sodium, and aromatic spirits of ammonium two or three times during the night.

This patient remained in the hospital from January 5 to January 24, progressively growing weaker; temperature never getting below 100° but twice,—on the 12th and 19th,—and then ran down to 97° in the morning; evening temperature ranged between 102.5° and 104°; respiration grew more rapid, dyspnœa great; no marked effect of treatment was noticed. Diarrhœa was kept under control by tannic acid, tincture of opium, and finally nitrate of silver and opium.

CASE XXII.—Carrie V., sister of D. V., aged 20; American; single.

Family history bad. She was well until two years ago, when she began to grow pale and emaciated. Has had cough since last winter. Before that, for about six months, she was troubled with hawking and considerable hoarseness; subject to colds; never had hæmoptysis; has had dyspepsia and diarrhœa more or less during the last year, which during last summer was quite persistent; has had night-sweats frequently since last September; no menstruation for six months.

Physical Signs.—December 29, 1890, gurgling mucous râles and pectoriloquy over upper right back and front; bronchial respiration; bronchophony over upper left. Pale, waxy appearance; very much emaciated; very weak, unable to sit up more than half an hour or an hour at a time; bowels tender, tympanitic, and "loose;" evacuations watery; expectoration copious; cheesy, and teeming with bacilli; swelling of both feet and ankles; pulse small, thready, 112; respiration 30, temperature 102°; anorexia persistent; dull and sleepy.

Treatment.—Mosquera's food (1 drachm) every two hours; 2 drachms of whiskey, 10 minims of chloranodyne, with 5 grains of tannic acid every four hours; hypodermic injections of gold and sodium chloride ($\frac{1}{15}$ grain) morning and evening. The dose of the injection was gradually increased to $\frac{1}{10}$ grain twice a day and $\frac{1}{8}$ grain once daily. No reaction seemed to follow, excepting after the one of January 5 a sense of increased strength came to the patient, lasting three or four hours. This occurred after each injection for a while. There was also slight diminution of the œdema of the feet noticed. The injection seemed to have no effect on the temperature whatever; regular hectic fever, with temperature rising to 102.5° and 103.5° every evening, and 97° to 98° every morning, continued. During the time of the injection of $\frac{1}{8}$ grain of gold and sodium it was noticed that the nocturnal sweating increased. No change in the quantity of bacilli in the sputum took place. Patient left the hospital January 24 with her sister, since which time they have not been heard from.

CASE XXIII.—S. S. P., aged 30; native of Michigan; residence on the shore of Lake Huron; habits good; occupation, lawyer, with very little out-door life.

Family History.—Father died of phthisis, and two brothers of pneumonia (?) or phthisis. One brother living, healthy, aged 36; maternal relatives healthy. He was never very fleshy, but tolerably well; had hæmoptysis twice last spring, not very much in amount each time; chills and fever more or less ever since. Began to cough last February; dated it to an attack of "la grippe," and has coughed since and expectorated considerably, especially in

the morning. Has suffered more or less with indigestion, but no diarrhœa; has had no nocturnal sweating.

August 11. — Present appearance spare; height, five feet seven inches; weight, one hundred and thirty pounds; pulse 100, temperature 99°, respiration 20; coughs considerably, but slight expectoration, white in color; pain in right side of chest on and off, not aggravated by movement; sleeps well; nasal passages not obstructed and only occasional extra discharge; has pain, odynphagia, and hoarseness lasting for two or three days at a time.

October 25.—Physical exploration of the chest shows slight dulness over upper right front, prolonged jerky expectoration, exaggerated vocal resonance; laryngoscopic examination shows the whole larynx hyperæmic, with some extra mucus; no particular swelling of the arytenoids; sputum contains a few tubercle bacilli. He consulted me again, at the office, on October 25, and the cough had continued since I saw him. He thought he felt a little weaker; had not had night-perspiration much since last visit, and his appetite was tolerably good and his bowels regular, although he did not sleep as well; he had been troubled some at night by a cough; expectoration a little more than formerly; also some increased pain in the chest; breath shorter.

Physical signs at this date: Bronchial respiration and bronchophony very pronounced, with moist râles over upper right front; exaggerated murmur on the left side; expectoration contains tubercle bacilli. He entered the hospital November 1, his condition as follows: Respiration 28, pulse 88, temperature 98°; this was about noon. At 8 P.M. this date, the respiration was 30, pulse 96, and the temperature 99.5°. He perspired easily upon exertion; appetite quite poor, with slight nausea; bowels regular; tongue somewhat coated. He complained of some slight soreness in swallowing; voice a little husky. Laryngoscopic examination showed the pharynx and fauces quite red, with abundant secretion in crypts of tonsil. Upper larynx also red; vocal cords brownish white; not much swelling.

Prescribed for him bismuth (fifteen grains) half an hour before meals; inhalation, in inhaling-room, of eucalyptol, 1 ounce, twice a day, with inhalation from face-shield inhaler of the spray of bichloride of mercury, 1 to 3000, once daily before eating; Mosquera's food in the afternoon, evening, and at bedtime. On November 3 inhalation of chlorine gas was prescribed, but, on account of the production of severe cough and irritation of throat, it was discontinued, and the bichloride of mercury and eucalyptol was resumed. On November 6 he received a hypodermic injection of iodine, $\frac{1}{12}$ grain. This was continued every night until the 11th, when it was increased to $\frac{1}{8}$ grain, and on the 14th to $\frac{1}{2}$ grain. Coryza, discharge of the nose, and slight diarrhœa with cutaneous eruption having appeared on the 15th, the dose was reduced to $\frac{1}{12}$ grain. Range of temperature up to the 12th of November was from 98° in the morning to 100.2° in the evening. November 7 to 19 it decreased by 98.5° in the morning to 99.5° in the evening, excepting on the 14th and 16th, when it went to 97° in the morning. On the 18th, the time of the last $\frac{1}{2}$-grain hypodermic injection, the temperature rose to 100.5° and remained for about four hours, gradually decreasing, however, and not rising again, except on the 23d, when there was a slight rise again for an hour. From November 14 to 24 he was put in the cabinet twice a day for three minutes each time. The examination of sputum just before leaving the hospital showed no tubercle bacilli present; the respiration was very much improved, the general strength had returned, the appetite was good, the bowels quite regular, and he slept pretty well all night; the cough had pretty nearly ceased; expectoration amounted to no more than two drachms on that morning; the physical signs showed no râles, but slight coarse respiration of the upper right front. Soon after leaving the hospital he went to Arizona for the winter, where he has since been, and at last report from him (two weeks ago) he had been steadily gaining in weight and had little or no cough. He considered himself perfectly well.

Case XXIV.—Mrs. D. H., aged 36; American; housewife; widow; four children; domiciliary surroundings good; habits good; has always worked at housework.

Family history good. Husband died of consumption three months ago; attended him and did her housework besides. Was always well until about three months ago, when she began to have a dry, hacking cough, followed by pain in the left side of chest and severer coughing; and then began to expectorate yellowish, thick sputum, which gradually grew whiter and thinner. Expectoration occasionally streaked with blood, but never had hæmoptysis. Appetite fair; bowels regular; menstruation regular; sleeps well, excepting for cough and slight sweating.

January 2.—Looks pale; not thin; slow of movement; slight swelling of the feet, especially in the evening; some dyspnœa on exertion; respiration 28, pulse 110, temperature 100.5°; expectoration not profuse, contains tubercle bacilli and pus. Examination of urine on the 3d revealed the presence of albumen, granular casts, pus corpuscles, and urates; reaction alkaline; specific gravity 1010. Voice all right; no odynphagia.

Physical Signs.—Slight dulness on percussion over upper left front and back; bronchial respiration, bronchophony, with mucous râles over upper left front down to the fourth rib and over apex behind; loss of vesicular quality and subscapular râles over right apex; vesicular quality weak.

Treatment.—Bone-meal and malt, with two drachms of whiskey, three times daily; Mosquera's food and milk between meals; hypodermic injection of iodine, $\frac{1}{12}$ grain, to be increased to $\frac{1}{6}$ grain gradually.

Temperature ranged from 98° in the morning to 100.5° to 101° up to the 11th, when the morning temperature was 97°, and at 2 P.M. it was 101.8°, and at 8 P.M., 102.2°. At this time she was receiving $\frac{1}{6}$ grain of iodine. Puffiness of the feet was still present, with no change in the urine excepting that it was less in quantity; expectoration diminished, and more "shortness of breath;" bowels "loose" from the 11th to the 14th. The iodine was now substituted with chloride of gold and sodium, $\frac{1}{10}$ grain, and, instead of the bone-meal and malt formerly given, dilute (15 minims) nitro-muriatic acid was given in water before each meal. Nourishment continued the same. January 15, malt ale was given three times a day with 10 minims of tincture of capsicum, and the nitro-muriatic acid was discontinued on account of redness of tongue. Anorexia seemed to be complete. Evening temperature gradually ranged from 98.5° in the morning to 100.2° in the evening until February 5, when the evening temperature reached 102.8°. Inhalations of chlorine were kept up from January 10 to the time she left the hospital, nausea and vomiting following the use of chlorine twice only. She was able to take two and sometimes three inhalations of chlorine gas daily very well, without excessive coughing at any time following. On February 3 examination of sputum showed absence of tubercle bacilli and great diminution of expectoration and cough. The anorexia, however, remained, and there seemed to be no marked increase of strength, but a falling of body-weight. The physical signs showed absence of râles, broncho-vesicular and bronchial respiration remaining. Examination of urine still disclosed presence of albumen and casts, but these were fewer and broken; the œdema was lessened. She returned to her home in Chicago in February, since which time we have not heard from her, although we suppose her physician is keeping up the treatment. We found no tubercle bacilli in the urine.

Case XXV.—Mrs. E. L., aged 29; American; widow five years; husband died of pneumonia; hygienic surroundings good; has not taken good care of herself, having kept late hours, attended entertainments, etc.; been telegraph operator for four years, and worked hard.

Family History.—Mother lost three sisters of phthisis pulmonalis; father died of pneumonia, aged 56; nephew died of phthisis; one sister died of pneumonia. She was generally pretty well, though very nervous, until last winter, when she was seized with "la grippe," followed by pneumonia, from which she was ill in bed five weeks, after which she went to Chicago, where she improved until September, 1890, when, while travelling, she took a severe cold, and has since felt worse. She has been coughing since last winter, sometimes expectorating very little, at other times freely. Had hæmoptysis first last January, expectorating then three ounces of bright aerated blood. This has frequently occurred since (expectorating thin blood), but usually just preceding menstrual period. She had "chills and fever" on and off for the last few months, and also what she calls "fainting spells." Capricious appetite; does not digest food easily; vomits often; diarrhœa and constipation alternately. Never sleeps well; has nocturnal sweating more or less.

January 18.—Respiration 36, pulse 80, temperature 99°; very restless and nervous; skin moist; tongue coated; bowels regular; not much appetite; feeling of emptiness at epigastrium; erratic pains about chest and abdomen; feels very weak, unable to walk very far; after exertion perspires freely, and has dyspnœa; a few tubercle bacilli in sputum.

Physical Signs.—Dulness on percussion, and bronchial respiration over upper third of left lung, with moist crackling at apex.

Treatment consisted of compound tincture of gentian with bone-meal three times per day; glass of hot water every morning; hypodermic injection of gold and sodium ($\frac{1}{20}$ grain) at night; solution of bromide of potassium (10 grains), also at night; chlorine inhalation once daily (fifteen minutes in inhaling-room);

inhalation of ether and chloroform at night, if necessary to allay cough. The first hypodermic injection was followed by slight nausea, and pain through both limbs and back. After this there seemed to be no further disturbance from the injections, the dose of which was gradually increased up to the 31st, when she received $\frac{1}{8}$ grain. This was followed by vertigo and dilatation of pupils. On February 1 the same symptoms followed a like injection, with considerable nervous irritability in addition. The dose was lessened to $\frac{1}{10}$ grain, which was given every night until the 7th of February. On account of copious perspiration, the hypodermic injection was omitted until the 10th, and from that time $\frac{1}{10}$ grain was given every other night.

The range of temperature varied from 98° to 100.5° up to the 1st of February. From that time it gradually decreased. On the 4th and 5th of February it remained at 98° nearly throughout the twenty-four hours, which was probably occasioned by a diarrhœa excited by eating some nuts. During the forty-eight hours just mentioned she had seventeen movements of the bowels. This condition was checked, and the temperature soon became normal, although the bowels remained "loose" up to the 12th of February. On the 10th and 12th of February the evening temperature went up and remained for about an hour at 101°, and on February 13, after an injection of $\frac{1}{8}$ grain of gold and sodium, temperature went up to 104.2° for about an hour. Her bowels continued "loose" during the time that she remained in the hospital. Examination of sputum February 11 showed scarcely any bacilli. She had very little cough, excepting at night, and very little expectoration. She was obliged to leave the hospital on account of some domestic matters, and returned to her home, where her treatment was kept up for a while by her family physician. We have not heard from her since about the 2d of March. She was then doing well.

Physical exploration of the chest on February 26 showed absence of moist râles, but instead sibilant and creaking. Other signs the same.

Case XXVI.—Mrs. C. C., aged 30; native of Ohio; married; two children; hygienic surroundings tolerably good; habits good, although she has always worked hard.

Family history good. She has been complaining for eight years of "stomach disorder" of one sort or another; before that she was generally well. Has not had any uterine disease of any sort. Has been coughing more or less (especially mornings) for three years. Has taken considerable medicine. The sputum on two or three occasions was streaked with blood, but she never had any real hæmoptysis. Generally had pretty good appetite; bowels regular; has slept well. Menstruation for last year has been rather irregular.

January 28.—Respiration 28, pulse 100, temperature 99°; feels quite weak, looks pale; wants to lie down the greater part of the day; perspires easily; very little appetite; bowels constipated; some headache; pain in back part of chest. Has considerable cough and expectoration, which is thick and contains much offensive matter, and tubercle bacilli.

Laryngoscopic Examination.—Mucous membrane of larynx and pharynx somewhat pale. Physical exploration of the chest shows dulness on percussion, and sibilant râles over upper left front and back. Bronchial respiration and bronchophony, but no moist râles over the upper right front and axillary region. The right back shows diminution of respiratory murmur, with high-pitched, prolonged expiration.

Treatment.—Hypodermic injections of iodine, $\frac{1}{12}$ grain; inhalation of chlorine gas (1 drachm of chlorinated lime) three times a day; cone inhalation of spirits of chloroform and ether at night to allay cough; compound tincture of gentian, two teaspoonfuls three times a day before eating; glass of milk between meals at dinner and evening; phosphate of sodium, 20 grains, occasionally, in the morning in hot water, as a laxative.

The temperature on the evenings of the 8th, 9th, and 10th was only 99°, but from the 11th to the 15th the evening temperature rose to 101.2°; morning temperature 98.5°. There was also some increased salivation on the 14th; also eruption of the skin, with slight coryza, and diminution in quantity of urine and expectoration. The injections had reached $\frac{1}{8}$ grain. From the 15th the iodine was diminished to $\frac{1}{10}$ grain, and continued at that until the 27th of January. During this time the temperature ranged from 98.5° in the morning to 99.8° and 100° in the evening. The expectoration, which was at first diminished, began increasing rapidly; there was a great deal of cough in the evening and during the night. The extra discharge from the nose continuing, on January 28 a spray of Dobell's solution was used through the nasal passages. On the 18th she complained of feeling somewhat weaker, which could not be accounted for, but the next day this sensation seemed to disappear. On January 27 $\frac{1}{8}$ grain of iodine, and on January 28 $\frac{1}{4}$ grain, was administered

hypodermically. The symptoms of iodism came on again, but with less violence, and the injection was now changed to chloride of gold and sodium, $\frac{1}{10}$ grain. This was continued up to February 5, when $\frac{1}{5}$ grain was given; February 6, $\frac{1}{3}$ grain was given, which produced perspiration, some diarrhœa, a feeling of constriction about the body, and headache. These symptoms lasted about four hours. The dose was diminished to $\frac{1}{10}$ grain, and continued to February 12, when a hypodermic injection of $\frac{1}{3}$ grain of iodine was given instead of the gold. In the mean time the expectoration had greatly diminished. The temperature range continued from 98.5° in the morning to 99.5° in the evening, once in a while going up to 100°, until she left the hospital.

February 18.—The cough and expectoration greatly diminished, occurring only at night. Her strength was greatly increased. The color of lips and mucous membranes generally better. Laryngoscopic examination showed the mucous membrane of the larynx and pharynx still a little pale. Appetite was better and bowels regular. The physical signs showed a very decided clearing up of the bronchial respiration, and bronchophony over the right lung. Sibilant râles and creaking were still present over the upper left, and also some creaking râles over the upper right. The examination of the sputum on the 17th of February showed still a few tubercle bacilli present. The treatment had been continued by her physician at home, who uses two or three hypodermic injections a week of the iodine and gold and sodium alternately, and the last report shows that the patient has continued to improve steadily since leaving the hospital.

Case XXVII.—P. T., aged 32; native of Michigan; married; has one healthy child; farmer; always worked very hard until becoming ill. Habits good; always smoked and chewed moderately.

Family history good. He says he was always well until attacked by "la grippe" last winter, since which time he has felt weaker, and has had more or less cough and hoarseness ever since. He is worse in the morning, at which time he expectorates considerable. Appetite has been fairly good; bowels regular; has slept well, excepting for cough. Never had hæmoptysis. During last winter he had chills and fever more or less all the time. He has been hoarse, he thinks, for nearly a year.

January 29.—Looks very well in the face, though pale; six feet in height; former weight, one hundred and sixty-five pounds; present weight not known. He has considerable cough and expectoration in the morning; slight pain on swallowing; more or less hoarseness, which is worse in the afternoon and evening; pain in the left side of chest; no indigestion or diarrhœa; not much extra discharge from the nose; no nasal stenosis; has not "lost very much flesh" during the last year, but is conscious of being weaker. Respiration 26, pulse 80, temperature 100.2°.

Physical Signs.—Sputum teeming with bacilli. Laryngoscopic examination shows both arytenoids quite swollen and red; larynx very red, but no erosions noticeable. Percussion dull over both upper fronts and also left back; small cavity in the upper right apex as evinced by whispering pectoriloquy, cavernous respiration, and occasional thick râles; over the upper left front there are a few moist râles; bronchophony and bronchial respiration also at the left apex behind. There was broncho-vesicular respiration, with diminished fremitus, at the lower left back, and prolonged expiration; creaking and sibilant râles in the left scapular and left mammary region; increased percussion resonance over right back.

Treatment.—Hypodermic injection of iodine ($\frac{1}{3}$ grain) every day. Inhalation of chlorine gas (twenty minutes in inhaling-room) twice a day; bitartrate of potassium, $\frac{1}{2}$ drachm in a glass of water, every morning; beef-tea; milk three times a day between meals; bone-meal twice daily. From January 29 to February 2 the evening temperature rose from 100.5° to 101°, and the morning temperature from 98.5° to 99°. Voice became more husky, almost aphonic; increased soreness of the throat amounting to odynphagia. Laryngoscopic examination showed no increase of hyperæmia, but increase of secretion. Expectoration also increased and became a watery mucus. The dose of iodine was now reduced to $\frac{1}{12}$ grain. On the night of February 3 an insufflation of iodoform and morphine was given to allay soreness of throat. From this time on the temperature gradually decreased, the evening temperature never going above 100°, and the morning temperature being from 98.5° to 99°, excepting on the morning of February 9, when it went up to 100°. He complained of more soreness across the front of chest at this time. The voice gradually grew better, although remaining hoarse, and pain upon swallowing rapidly diminished. He took a hypodermic injection of $\frac{1}{6}$ grain of iodine from this time on to the 18th, when he left the hospital. From the

11th to the 18th the temperature remained normal, and the pulse between 84 and 90. Examination of sputum on February 16 disclosed only a few tubercle bacilli present. The expectoration had diminished to about half an ounce in the twenty-four hours. Urine was highly colored, but contained only an excess of phosphates and muriates.

Physical signs on the 9th showed diminution of consolidation over the chest, and instead of moist râles at the upper right chest there were sibilant râles; although there were moist râles still at the upper left front, they were much less marked, and were replaced largely by creaking and sibilant ones. The swelling of the arytenoids was very much less, no erosion, and hyperæmia very much diminished. He was obliged to leave the hospital on February 18 on account of some matters pertaining to his farm, and returned to the hospital again in March, having been very well until three or four days before his return, when, by getting his feet wet, he took a severe cold, which increased the hoarseness and brought about a return of the odynphagia, with some increase of cough and expectoration. He, however, looked very well, felt strong, had a good appetite, and coughed but little. He expectorated about an ounce in twenty-four hours. The sputum on entering the hospital again showed a very few bacilli, but at this time (March 23) they have entirely disappeared from his sputum. His temperature varies only about half a degree between morning and evening. His voice is still hoarse, and there is some thickening of the laryngeal mucous membrane yet. He is still under treatment in Harper Hospital, and receives an injection of iodine, ⅓ grain, and gold and sodium chloride, $\frac{1}{10}$ grain, on alternate days. He gets one inhalation daily, through the face-shield inhaler, of chlorine water and solution of chloride of sodium.

HEAT PHENOMENA IN CURARIZED ANIMALS.

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(Continued from page 159.)

Part II.

THIRD SERIES.—*The Actions on Heat Production and Heat Dissipation.*—Since the maintenance of the mean temperature of the body is dependent upon the reciprocal relations existing between the processes of heat production and heat dissipation, the causes of the temperature alterations in the curarized animal are to be sought in actions on one or both of these.

A number of investigators, taking the absorption of O and the elimination of CO_2 as indices of tissue metamorphosis, and consequently of heat production, assert that the activity of this process is diminished; but such methods, as I have already pointed out elsewhere, are far from being reliable. The only means upon which we can place absolute reliance is direct calorimetry, which has the additional advantage of enabling us to study coincidently the effects on heat dissipation. The only calorimetrical experiments on record were performed by Kemp (*loc. cit.*) in our laboratories. These comprise fourteen observations on dogs, each of which was conducted generally for two hours,—one hour with the normal animal and the other with the animal curarized. In several instances, however, the studies in the curarized condition lasted for two consecutive hours. The doses employed varied from what was just sufficient to cause paralysis of voluntary motion to quantities largely in excess. In summing up these results, together with those of his observations only on the temperature, he reaches the following conclusions:

"The injection of small doses of curare is followed by a rise in temperature.

"After the injection of larger doses the bodily temperature falls. This fall is preceded, however, by a rise more or less marked.

"The rise from the small dose is brought about by an actual increase in the heat production of the body.

"The fall, while sometimes aided by vasomotor phenomena, which cause increased heat dissipation, is regularly due to a lessening of the amount of heat produced."

These experiments, therefore, show that the increase of temperature is coincident with an increase of heat production, and the diminution of temperature to a decrease of heat production and an increase of heat dissipation.

My own experiments, which were pursued on a more elaborate scale and with a greatly improved instrument, are in essential respects in accord with Kemp's, but some new facts have been elicited. Thus, I have found that when an increase of temperature occurred, both heat production and heat dissipation were usually increased, the former being, of course, in excess. In experiments in which

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the temperature was diminished, sometimes heat production was diminished and dissipation increased, and in others heat production was not in the least affected, the fall being solely due to an increase of heat dissipation. The temperature may be profoundly affected without heat production being in the least altered. In some experiments the fall during the first hour was due to a decided diminution of heat production, associated with an increase in heat dissipation, while during succeeding hours heat production would be normal and the temperature continue to decline, owing solely to a persistent continuance of the increase in heat dissipation. In curarized animals, as well as in those in a normal condition, the alterations in temperature are by no means reliable indices of the actions on one or the other of these processes, yet it may be stated with positiveness that when a decided rise of temperature occurs, heat production is primarily the process affected; and that a fall of temperature almost with certainty indicates a dependence upon increased heat dissipation — a diminution of heat production being altogether a subsidiary factor, unless the dose has been unnecessarily large, or when the decrease immediately follows the injection.

In the six experiments included in the present series no primary increase in temperature occurred, but always a more or less decided diminution. Animals were chosen for this work in which there was no apparent tendency to an increase, because it is only in such that the actions of pyretics can be studied. In all of these the dogs were anæsthetized, and a tracheal tube inserted about an hour before the experiments began. After being placed in the calorimeter, the normal heat production and dissipation were determined for one or two hours, the animal then curarized, and hourly observations made for from three to six consecutive hours.

The heat units represent kilogramme degrees, and the thermometric records are in the Centigrade scale.

In studying these records it is necessary to keep in mind the continual and uncertain variations in heat production and heat dissipation which occur in normal animals; also the tendency to a decline in heat production, heat dissipation, and bodily temperature when animals are confined within the calorimeter for successive hours. Composite curves, made from the results of eight experiments on normal animals (*University Medical Magazine*, April, 1890), which were studied for six successive hours, show that both heat production and heat dissipation are progressively diminished throughout the entire periods of observation, the most marked effects occurring the first hours (see Fig. 1). Excepting during the sixth hour, more heat is dissipated than produced, hence a continual fall of temperature occurs during the first five hours.

Should we construct similar composite curves from the results of the experiments with curare (see Fig. 2), it will be observed that heat production during the first hour is diminished slightly more than in normal animals, and that after this production returns to the normal, and remains remarkably constant during the subsequent hours. Heat dissipation, however, is in excess of the normal during the first and second hours, especially during the former, and during the third and fourth hours is below normal. Hence the temperature falls during the first hour from diminished production and increased heat dissipation, during the second hour from the continued increase of dissipation, during the third hour from diminished production, and during the fourth hour the temperature rises, owing to diminished dissipation. The chief and only important differences between these curves and those of normal experiments are: The increase above the normal of heat dissipation during the first and second hours, the slightly greater decrease in heat production during the first hour, and the almost normal heat production during the subsequent hours.

A critical study of the individual experiments will show that curare in such doses will cause essentially two classes of results which are to be distinguished on the one hand by no specific effect on heat production, and on the other by a decided diminution during the first hour after the injection. Thus, in Experiments 49, 50, 51, and 52 it is evident that there was no specific effect on heat production, yet heat dissipation, as a rule, was decidedly increased, and a fall of temperature occurs from this action. The results of Experiments 53 and 54 illustrate instances of the second class, in which, during the first hour, heat production is diminished decidedly, and in which, during the subsequent hours, the records do not materially differ from those of the first class. These experiments have been largely repeated, and always with concordant results,—either there would be no effect on heat production, as in the first set of experiments, or a notable decrease during

the first hour. In the latter class the fall of temperature is always more decided.

It is important to note that even though the curarized condition is maintained by sufficiently repeated injections of curare, the subsequent doses do not by any means reproduce the effects of the first. This is strikingly illustrated in Experiments 53 and 54.

THIRD SERIES.—*The Actions on Heat Production and Heat Dissipation.*

Experiment 49.—Dog; weight, 8.617 kilos.

	Hourly heat production.	Hourly heat dissipation.	Rectal temperature.			Mean room temperature.
			Beginning of hour.	Ending of hour.	Gain or loss (+ or —).	
First hour before curare	27.965	27.000	38.50°	38.64°	+ 0.14°	22.2°
Second hour before curare	28.309	27.000	38.64°	38.83°	+ 0.19°	23.0°
*First hour after curare	27.919	32.400	38.83°	38.18°	— 0.65°	23.2°
Second hour after curare	28.605	31.500	38.18°	37.76°	— 0.42°	23.4°
Third hour after curare	31.550	27 000	37.76°	38.42°	+ 0.66°	22.5°
Fourth hour after curare	28.440	25.200	38.42°	38.89°	+ 0.47°	22.7°

Experiment 50.—Dog; weight, 11.11 kilos.

First hour before curare	33.867	36.000	39.77°	39.53°	— 0.24°	21.1°
*First hour after curare	34.536	37.800	39.53°	39.12°	— 0.41°	22.0°
Second hour after curare	30.368	35.200	39.12°	38.58°	— 0.54°	22.5°
Third hour after curare	29.036	32.400	38.58°	38.17°	— 0.41°	23.2°

Experiment 51.—Dog; weight, 7.712 kilos.

First hour before curare	16.674	17.414	38.25°	38.35°	— 0.12°	20.2°
*First hour after curare	15.147	20.700	38.35°	37.45°	— 0 90°	20.7°
*Second hour after curare	18.823	21.600	37.45°	37.00°	— 0.45°	20.8°
Third hour after curare	16.432	18.900	37.00°	36 60°	— 0.40°	21.0°
*Fourth hour after curare	17.768	15.300	36.60°	37.00°	+ 0.40°	20.8°
Fifth hour after curare	17.485	14.400	37.00°	37.50°	+ 0.50°	20.6°

Experiment 52.—Dog; weight, 8.163 kilos.

First hour before curare	25.975	24.212	38.28°	38.55°	+ 0.27°	18.2°
*First hour after curare	24.296	28.806	38.55°	38.12°	— 0.43°	18.4°
*Second hour after curare	25.558	23.403	38.12°	38.45°	+ 0.33°	18 0°
*Third hour after curare	23.490	22.511	38.45°	38.60°	+ 0.15°	18.2°
Fourth hour after curare	24.471	22.512	38.60°	38.90°	+ 0.30°	18.3°
*Fifth hour after curare	25.285	24.306	38.90°	38.75°	— 0.15°	18.7°

Experiment 53.—Dog; weight, 9.297 kilos.

First hour before curare	14.102	14.102	38.90°	38.90°	± 0.00°	21.2°
*First hour after curare	8.644	19.800	38.90°	37.40°	— 1.50°	21.3°
Second hour after curare	13.972	14.000	37.25°	37.20°	— 0.05°	21.2°
*Third hour after curare	14.656	18.003	37.25°	36.80°	— 0.45°	21.0°
Fourth hour after curare	16.242	18.101	36.80°	37.05°	— 0.25°	21.6°
*Fifth hour after curare	11.387	9.900	37.05°	37.25°	+ 0.20°	22.0°

Experiment 54.—Dog; weight, 7.7 kilos.

*First hour before curare	15.355	14.123	39.70°	39.90°	+ 0.20°	19.8°
*First hour after curare	8.784	17.100	39.90°	38.55°	— 1.35°	19.9°
*Second hour after curare	16.128	18.900	38.55°	38.10°	— 0.45°	19.4°
*Third hour after curare	14.010	11.700	38.10°	38.40°	+ 0.30°	19.5°
Fourth hour after curare	14.481	11.709	38.40°	38.85°	+ 0.45°	19.7°
*Fifth hour after curare	15.712	12.632	38.85°	39.35°	+ 0.50°	19.4°

* Curare injected.

FOURTH SERIES.—*The Actions on Heat Production and Heat Dissipation of Cocaine and Caffeine in Curarized Animals.*

Experiment 55.—Dog; weight, 10.884 kilos.

	Hourly heat production.	Hourly heat dissipation.	Rectal temperature.			Mean room temperature.
			Beginning of hour.	Ending of hour.	Gain or loss (+ or —).	
First hour before cocaine	26.212	27.082	39.28°	39.18°	— 0.10°	18.7°
*First hour after cocaine	23.323	28.025	39.18°	38.64°	— 0.54°	19.2°
*Second hour after cocaine	26.163	26.250	38.64°	38.63°	— 0.01°	20.3°
Third hour after cocaine	27.126	27.300	38.63°	38.61°	— 0.02°	21.0°
*Fourth hour after cocaine	28.037	25.600	38.61°	38.89°	+ 0.25°	20.4°
*Fifth hour after cocaine	22.153	25.200	38.89°	38.54°	— 0.35°	20.2°

Experiment 56.—Dog; weight, 8.833 kilos.

First hour before cocaine	21.507	29.675	38.66°	37.95°	— 0.71°	23.4°
First hour after cocaine	26.789	25.800	37.95°	38.09°	+ 0.14°	23.0°
*Second hour after cocaine	23.566	23.425	38.09°	38.11°	+ 0.02°	23.2°
Third hour after cocaine	24.065	23.500	38.11°	38.19°	+ 0.08°	23.5°
Fourth hour after cocaine	32.267	24.000	38.19°	39.36°	+ 1.17°	23.4°

Experiment 57.—Dog; weight, 10.884 kilos.

First hour before cocaine	12.670	27.750	39.55°	37.82°	— 1.73°	20.1°
*First hour after cocaine	21.422	27.175	37.82°	37.16°	— 0.66°	20.6°
Second hour after cocaine	20.326	20.675	37.16°	37.12°	— 0.04°	20.6°
*Third hour after cocaine	21.763	21.850	37.12°	37.11°	— 0.01°	21.3°
Fourth hour after cocaine	20.569	19.000	37.11°	37.29°	+ 0.18°	20.5°

Experiment 58.—Dog; weight, 5.442 kilos.

First hour before cocaine	7.583	10.500	37.95°	37.28°	— 0.67°	22.2°
First hour after cocaine	12.498	13.500	37.28°	37.05°	— 0.23°	22.6°
Second hour after cocaine	13.838	12.750	37.05°	37.30°	+ 0.25°	21.8°
Third hour after cocaine	13.427	11.250	37.30°	37.80°	+ 0.50°	22.0°
Fourth hour after cocaine	11.772	11.250	37.80°	37.92°	+ 0.12°	22.2°

Experiment 59.—Dog; weight, 8.16 kilos.

First hour before cocaine	9.776	16.500	38.70°	37.67°	— 1.03°	19.3°
*First hour after cocaine	13.108	13.500	37.67°	37.61°	— 0.06°	19.7°
Second hour after cocaine	17.872	15.000	37.61°	38.15°	+ 0.44°	19.6°
Third hour after cocaine	15.326	15.000	38.15°	38.20°	+ 0.05°	19.6°
*Fourth hour after cocaine	16.535	14.250	38.20°	38.55°	+ 0.35°	19.8°
Fifth hour after cocaine	17.514	14.250	38.55°	39.00°	+ 0.45°	19.7°

Experiment 60.—Dog; weight, 6.349 kilos.

First hour before caffeine	11.375	9.750	38.45°	38.77°	+ 0.32°	19.9°
*First hour after caffeine	10.906	10.500	38.77°	38.85°	+ 0.08°	20.2°
*Second hour after caffeine	11.758	11.250	38.85°	38.95°	+ 0.10°	20.6°
Third hour after caffeine	12.152	12.000	38.95°	38.98°	+ 0.03°	20.4°
*Fourth hour after caffeine	11.316	13.500	38.98°	38.55°	— 0.43°	20.5°
Fifth hour after caffeine	10.984	12.000	38.55°	38.35°	— 0.20°	20.4°

Experiment 61.—Dog; weight, 8.163 kilos.

First hour before caffeine	5.628	15.750	38.15°	36.60°	— 1.55°	18.4°
First hour after caffeine	18.036	15.750	36.60°	36.95°	+ 0.35°	18.4°
*Second hour after caffeine	20.842	17.250	36.95°	37.50°	+ 0.55°	18.5°
*Third hour after caffeine	20.974	15.750	37.50°	38.30°	+ 0.80°	18.4°
Fourth hour after caffeine	17.756	17.250	38.30°	38.35°	+ 0.05°	18.6°
Fifth hour after caffeine	17.359	14.250	38.35°	38.82°	+ 0.47°	18.6°

* Curare injected.

FOURTH SERIES.—*The Actions on Heat Production and Heat Dissipation of Cocaine and Caffeine in Curarized Animals.*—(Continued.)

Experiment 62.—Dog; weight, 10.884 kilos.

	Hourly heat production.	Hourly heat dissipation.	Rectal temperature.			Mean room temperature.
			Beginning of hour.	Ending of hour.	Gain or loss (+ or —).	
First hour before caffeine	21.312	28.800	38.03°	37.17°	— 0.86°	19.7°
*Second hour before caffeine	21.531	22.750	37.17°	37 03°	— 0.14°	19.8°
First hour after caffeine	18.439	23.750	37.03°	36.42°	— 0.61°	21.7°
Second hour after caffeine	23.514	21.250	36.42°	36.68°	+ 0.26°	21 9°
Third hour after caffeine	20.971	20.100	36.68°	36.78°	— 0.10°	22.2°

* Curare injected.

The fact developed by these experiments, that we may maintain an animal in the curarized state for hours without specifically affecting heat production, excepting, perhaps, during the first hour, is of pre-eminent importance, since we are thus enabled in calorimetrical studies to eliminate muscular movements which may affect the determination of the direct actions of heat-producing agents.

FOURTH SERIES.—*The Actions of Cocaine and Caffeine on Heat Production and Heat Dissipation.*—In the preceding series the results showed that certain pyrexial agents were apparently capable of causing a rise of temperature in curarized animals. This fact led to the performance of a number of experiments to determine in what way the heat processes are affected. In these only cocaine and caffeine were used, because of their having been carefully studied in normal animals, their constant effects, and the remarkable potency of the former to increase heat production and bodily temperature.

In these experiments, in order to avoid a rise in temperature and an increase of heat production by the curare itself, animals were selected in which, after giving the curare, the temperature showed a definite tendency downward. Five experiments were made with cocaine and three with caffeine. The doses

FIG. 1.—*The Curves of Heat Production and Heat Dissipation in Normal Animals.*

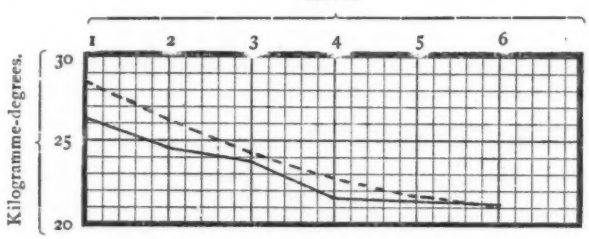
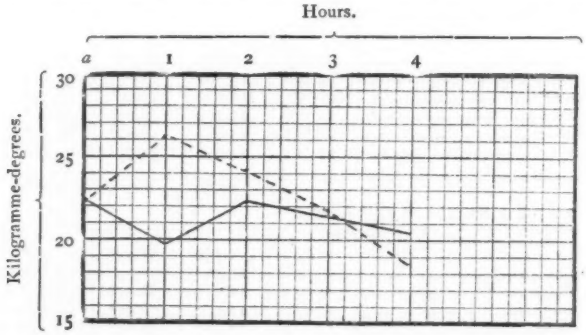


FIG. 2.—*The Actions of Curare on Heat Production and Heat Dissipation.*



were given subcutaneously, the cocaine in doses of .01 gramme to the kilo, and the caffeine .07 gramme to the kilo. The procedures in this series were the same as in the preceding, the only difference being the injection of one or the other of these substances before or after placing the animals within the calorimeter. Curare was also injected from time to time, as occasion demanded.

In a study of the actions of cocaine on the heat processes in normal animals (*University Medical Magazine*, May, 1889), I have found that similar doses will cause an enormous increase of heat production during the first

FIG. 3.—*The Actions of Curare and Cocaine on Heat Production and Heat Dissipation.*

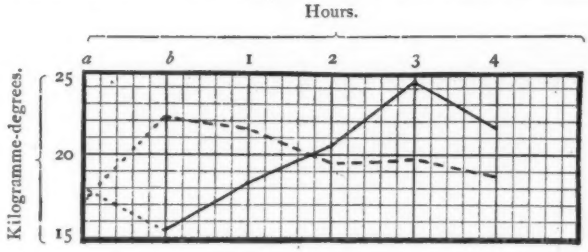
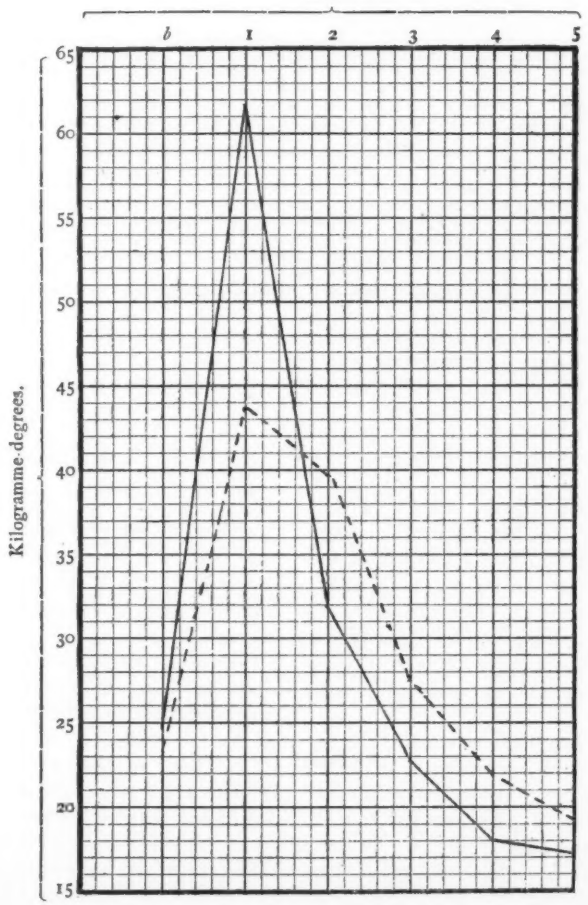


FIG. 4.—*The Actions of Cocaine on Heat Production and Heat Dissipation in Normal Animals.*



hour after injection, and that during the second hour production is still in excess of the normal, while during the three subsequent hours it is subnormal. Composite curves of these experiments (see Fig. 4) will show that during the first hour the average increase is about two and a half times the normal, and during the second hour about one-third of the normal. The curve of heat dissipation exhibits a marked increase during the first two hours, a slight increase during the third, and a diminution during the fourth and fifth hours.

Composite curves of the records of the experiments with curarized animals in which cocaine was used are of an entirely different character. In these experiments the animals were curarized, and then studied for an hour before the cocaine or caffeine was given. As we do not know what the heat production and heat dissipation were in the normal condition, it is fair to assume that the curves during the first hour under curare were the same as in the experiments of the third series, hence they may be provisionally inscribed on the diagrams. The curves in Fig. 3 represent the mean changes in the heat processes in those experiments of the fourth series in which cocaine was used. In order to appreciate what influence the cocaine may have exerted it is necessary to compare these curves both with those of animals curarized and with those in which the cocaine only was injected.

Comparing first the curves in Figs. 2 and 3, it will be observed that the curves of heat dissipation do not materially differ, while those of heat production differ only after the second hour of the curarized state; in the animals with curare only production shows a downward tendency, while in those with cocaine there is a decided movement upward. When, however, we compare Figs. 3 and 4, the differences are very striking. In the curarized animals the increase of heat production during the first hour after cocaine is not more than the mere return to the normal that occurs in animals simply curarized, while

FIG. 5.—*The Actions of Curare and Caffeine on Heat Production and Heat Dissipation.*

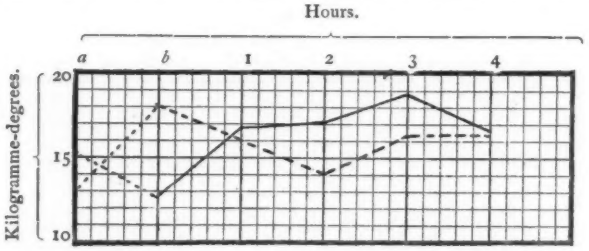
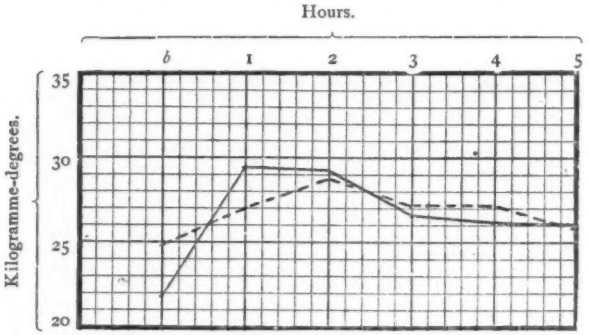


FIG. 6.—*The Actions of Caffeine on Heat Production and Heat Dissipation in Normal Animals.*



Solid lines (———) represent curves of heat production.
Broken lines (– – – –) represent curves of heat dissipation.
Dotted lines (- - - - -) represent assumed curves of heat dissipation and production.
The *a* line represents the time of giving curare in the curare experiments, and the normal standards of heat production and heat dissipation.
The *b* line represents the time of giving cocaine or caffeine when these were used.

in normal animals the increase is remarkable. In curarized animals production continues increasing during the two succeeding hours, and reaches a maximum increase of about fifty per cent. during the third hour, and then declines. In the normal animal, however, the climax of heat production is observed during the first hour, and during the third hour is actually subnormal, and also for succeeding hours. The curves of heat dissipation are wholly dissimilar, and in their relations to their respective curves of heat production are directly the opposite, heat dissipation in the curarized animals being in excess of production during the first hour after cocaine and less during the subsequent hours, while in normal animals precisely the reverse is the case. It is thus very evident that curare has prevented the appearance of the characteristic effects of cocaine. The dogs used in Experiments 55 and 59 were studied the following days in the calorimeter without curare, but with the same doses of cocaine. The results were identical with those in normal dogs, thus proving the preventive action of the curare.

A study of the effects of caffeine in curarized and normal animals (Figs. 5 and 6) will show that curare has also prevented the normal actions of caffeine, although not to so marked an extent as with cocaine. In curarized animals, heat production is continually increased during the first three hours, while in normal animals the highest point is attained during the first hour, there being an almost imperceptible decline from this point during the second hour, and during the following hours a gradual falling off. In both sets of experiments heat production remained above normal during the entire periods of observation. The curves of heat dissipation are dissimilar, and their relations to the curves of heat production are different, hence the temperature curves are unlike.

It is thus apparent that curare prevents cocaine from causing its characteristic effects, and that it is inefficient in antagonizing the actions of caffeine, although somewhat modifying the results.

The proper interpretation of these interesting results is, perhaps, a matter of speculation, but there are reasons for believing that cocaine causes an increase of heat production by exciting a thermogenic centre, which is located somewhere above the medulla oblongata, and that curare depresses or paralyzes this centre. The increase of heat production caused by caffeine is doubtless due to an action on some other part of the organism, and which is unaffected by curare in the doses employed.

It is important to note that, while curare prevents the enormous rise of heat production by cocaine, it does not affect the normal output of heat, excepting in those cases in which heat production is diminished during the first hour. It would seem probable from this that curare has paralyzed an accelerator centre, and left intact what may be considered as the automatic heat centre of the body. Caffeine may stimulate this latter centre, or directly excite chemical changes in the heat-producing tissues.

The following summary embraces the chief features of the actions of curare on the heat mechanism :

Doses insufficient to cause motor paralysis may increase the temperature, or primarily increase and secondarily diminish it.

Doses just sufficient to abolish voluntary motion act differently in different animals ; the temperature from the first may be increased or decreased, or primarily increased and secondarily diminished, or primarily diminished and secondarily increased. Generally there occurs a notable diminution or a decided increase, the former effect predominating.

Repeated doses may cause a progressive lowering of the temperature, or a progressive rise, until death ensues.

Large doses invariably diminish the temperature, excepting in certain cases where the animal has been under the influence of curare for some time, or when the temperature exhibits a strong tendency to rise.

The increase of temperature is due to an increase of heat production, and the fall to an increase of heat dissipation, which may to a great or little extent be aided by a diminution of heat production. Heat dissipation is always increased, but heat production may primarily be increased and secondarily diminished.

After doses just sufficient to abolish voluntary motion, heat dissipation is increased, and this generally is the sole factor in causing the fall of temperature, although during the hour immediately following the injection there may be a transient diminution of heat production to aid in the appearance of this phenomenon.

The variable effects on temperature are owing to the dual action of curare on the processes of production and dissipation ; heat dissipation is always increased, and thus tends to diminish temperature, but heat production

may coincidently be increased or diminished, and thus antagonize, or even supersede, or aid the effect of increased heat dissipation.

Cocaine is unable to produce its characteristic effects in animals even lightly curarized.

Caffeine is still capable of causing an increase of heat production and temperature, although the effects are somewhat modified.

Curare apparently depresses or paralyzes an accelerator heat centre, leaving intact the automatic heat centre.

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THE PLACE OF MERCURY IN THERAPEUTICS.

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(Continued from page 25.)

II.

CALOMEL IN INFANTILE THERAPEUTICS.

ONE of the most common remedies in infantile diseases in the practice of physicians of a former generation was calomel. It was the custom to give small doses of this mercurial in almost all the inflammatory affections, especially in peritonitis, pleuritis, pneumonia, meningitis, and in gastro-enteritis. Condie is one of the best exponents of this practice, and a glance over his "Practical Treatise on Diseases of Children," first published in 1850 (and once so much studied by some of us who may now reckon ourselves among the older members of the profession), will suffice to show the prominent place assigned to calomel in infantile therapeutics. Take, for instance, the treatment of pneumonia. A ¼ or ½ grain of calomel, with about the same quantity of ipecac, was given every three hours during the acute stage of the disease. Essentially the same treatment, following a purgative dose of calomel, was prescribed in acute peritonitis and in colitis.

In croup, large doses of calomel (2½ to 5 grains) were given every two hours, combined with $\frac{1}{12}$ grain of tartar emetic; this heroic treatment Condie supports by the appeal to eminent authorities. "Of the good effects of calomel in croup," he says, "we have abundant testimony. Given in large doses and at short intervals, it is the remedy upon which many physicians have almost exclusively depended for the cure of the disease; while in somewhat smaller doses, after bleeding, an emetic, and the warm bath, it is strongly recommended by a host of authorities. By some practitioners, calomel is directed in enormous doses, far greater than we should be inclined to prescribe; we nevertheless believe that the good effects of this remedy, in a disease of such rapid progress as croup, can be obtained only from its free administration."

Elsewhere Condie gives the *rationale* of the mode of action of the calomel: "Its tendency (*sic*) is to reduce the laryngo-tracheal inflammation, and thus to counteract the pseudo-membranous exudation."

There is no doubt that a similar reason, rather than considerations of empiricism alone, guided the practitioner of a past generation in the choice of calomel as the remedy *par excellence* in the phlegmasiæ of both infantile and adult life; it was given with the belief that it would act as an antiphlogistic.

Here was a medicine of almost universal applicability. As a considerable part of the patients of a physician's *clientèle* were sufferers from acute diseases, here was a remedy at hand which could strike a powerful blow, and generally in the right direction. If the disease were a fever, there were good authorities who affirmed that in grave cases, even of typhoid, it was a good thing to give calomel till the gums were touched, the pores and emunctories opened, the fever poison neutralized or removed; at any rate, amendment sometimes followed as soon as the system felt the influence of the mercurial. If the disease were of the nature of an acute phlegmasia, calomel *a fortiori* was indicated, to prevent organization and promote absorption of the exudation, if for no other reason. There was no occasion to make a very accurate diagnosis; the juvenile tyro might stand aghast before a disease of unknown proportions and nature, but the calomel treatment was indicated all the same, and it was not an easy matter to go astray. Therapeutics was reduced almost to the simplicity of the time of Molière, when *primum seignare, postea clysterizare, ensuita purgare* comprised the sum of the physician's art.

Was the old belief justified?

Is it our duty to give antiphlogistics in acute inflammatory diseases, and is calomel the proper antiphlogistic?

1. So greatly does the pathology of the present day differ from that of the past; so completely are we now dominated by the *damaged-tissue theory* of inflammation, and by the new views as to the *rôle* of microbes in most inflammatory diseases; so fully are we persuaded of the truth of the modern doc-

trine of the natural evolution and self-limited nature of all acute diseases, and of the necessity of husbanding the vital resources, that the very idea of antiphlogistic treatment belongs almost, along with that of witchcraft, to the superannuated notions of the past; while the true antiphlogistics are recognized to be such means, medical and surgical, as restore the damaged vital properties of the inflammatory *foyer* and of the organism generally, and antagonize and combat microbes and ptomaïnes. From this point of view, the belief of our predecessors was not justified by the facts. They saw patients get well from grave inflammations and from fevers, and they attributed the recovery to the medicines which they had prescribed,—a most unwarrantable *post hoc ergo propter hoc* conclusion. They, in short, ascribed to the bleeding, the antimony, and the calomel the favorable changes which belonged to the natural course of the disease itself.

"Since the day when it was understood that pneumonia might get well without bleeding, physicians asked themselves if the other inflammations, if the acute glandular swellings, might not also get well without mercurial inunctions and the general antiphlogistic regimen. They also demanded whether the acute pericardial, peritoneal, laryngeal cases which had been treated by calomel might not have followed the same evolution without the medicine which had been administered so lavishly." *

2. There seems to be no proof that calomel, when given in minute doses, whether to oppose the formation and organization of plastic exudations, or to stimulate the secernant organs and promote elimination, or to arouse the absorbents to greater activity in removing inflammatory products, ever serves any really good antiphlogistic purpose. It does, doubtless, perturb the nutritive processes and deglobulize the blood; it may even render the blood "aplastic." Whether, however, this be a good thing in an inflammatory disease, and with all the evil that is inflicted on the constitution of the blood, is not proved. Nor can we even invoke the help of the known microbicide properties of the mercurial, for there is no evidence that calomel, when given internally in fractional doses, has any such microbicide action.

It is true that calomel is still much given in meningitis, whether simple or tuberculous, small doses (¼ to 1 grain) being administered every hour or two. It cannot be shown that this treatment has ever done any good. The success which has been claimed for it is doubtless attributable, as Dujardin-Beaumetz remarks, to faulty diagnosis,—*i.e*, it is probable that the meningitis was of syphilitic rather than of tuberculous nature.

Many give calomel in meningitis because they are expected to give something, and, on account of the vomiting, nothing else is likely to stay down. Besides, who shall have the hardihood to gainsay the authorities that have advised it?

CALOMEL AS A PURGATIVE AND GASTRIC SEDATIVE.

Having been all my (medical) life a prescriber of calomel, if I were to sum up from my experience the uses of this mercurial in infantile therapeutics, I would say that calomel has seemed to me to do good,—1, as a gastric sedative; 2, as a purgative.

1. In the acute gastric catarrh of infancy and early childhood, a disease which is characterized by obstinate vomiting, lasting for several days, and is, I believe, often accompanied with hepatic congestion, I have often found small doses of hydrarg. subchloride, the only remedy that was borne by the stomach; and, coincidently with the supervention of free bilious purging, I have generally witnessed rapid amendment. This disease, when occurring in adults, is frequently benefited by the same treatment. The old-time physicians seem to have had unbounded faith in calomel in gastro-intestinal disease complicated with hepatic derangement. My former colleague and friend, Dr. Enoch Cross, who had for the last forty years of his life a "malarial liver," and who was subject to attacks of hepatic congestion with irritable stomach, used to resort to small doses of calomel whenever he felt one of his attacks coming on. There was nothing, he declared, which so speedily settled his stomach. He, besides, felt sure that the calomel had a real cholagogue action, and diminished the hepatic engorgement.

In acute indigestion (*embarras gastrique*) I have at times vainly tried to allay vomiting and move the bowels by other remedies, and have often been obliged to resort to calomel eventually, even if I avoided it at the beginning.

In cholera infantum, with constant vomiting and frequent watery stools, I have known minute doses ($\frac{1}{10}$ grain) of calomel, rubbed up with prepared chalk, to be well borne by the

* Hallopeau, "Du Mercure," p. 186.

stomach and apparently to stay vomiting. Yet calomel is not a remedy on which, I would much rely, and I place much more confidence in small pieces of ice, brandy, ice-cold applications if the fever be intense, pancreatized milk, starch and laudanum injections, etc.

If we seek an explanation of the sedation which so often follows the use of calomel in gastric derangements, we may assume that this is due (*a*) to an anæsthetic influence of the mercurial on the nerve-endings; (*b*) to an antiseptic action. Antiseptics in the stomach "prevent decomposition, and by thus lessening the production of irritating products, they diminish irritation of the stomach and arrest vomiting" (Lauder Brunton). Brunton thinks that it is probably to its antiseptic action that corrosive sublimate owes its curative power in cases of infantile dysentery, "and it is not improbable that the beneficial action of calomel is due to a similar action, for it has been found by Wassilieff greatly to retard the decomposition due to low organisms."*

2. Calomel will always remain one of the safest and most efficient purgatives. Clinical experience proves it to be a cholagogue, producing copious bilious stools; it also increases the secretions of the small intestines and promotes peristalsis. The smallness of its dose (1 to 10 grains), its tastelessness, the readiness with which it is tolerated by the stomach, make calomel one of the best cathartics in children's diseases, but it is equally indispensable in the therapeutics of adult life. When mercury acts as a cathartic, but a minimum quantity is absorbed, the greater part being eliminated with the stools, hence the objection which has been so often raised against the mercurial preparations when given for their constitutional effect *that they poison the blood* is hardly applicable to the full cathartic dose of calomel, which may be regarded as harmless as any other purgative.

GENERAL CONSIDERATIONS ON THE PURGATIVE ACTION OF CALOMEL.

The faith of very many excellent practitioners in the derivative power of purging in some inflammations—especially in those of the encephalon—is so great that it is almost a matter of routine to begin treatment by a 5-grain dose of calomel. In inflammations of the brain, calomel is often given *largo manu* with antiphlogistic intent; it is a forlorn possibility on which some hope is made to hang. He would be a hardy man who, when called to a case of apoplexy,—resisting the demands of the family that something should be done,—would refuse to put a few grains of calomel on the patient's tongue. Of course, much more may be expected of the calomel purge in intestinal inflammations. Here the calomel acts both as an antiseptic and a cathartic, and clears the bowels of foul, fermenting residua, and of microbes and ptomaïnes. It must be borne in mind that enteritis and colitis are largely microbe-diseases, aggravated, if not in every case caused, by irritating microbes and their ptomaïnes, and that restoration goes on *pari passu* with the success of attempts to render the intestinal canal antiseptically healthy. Dujardin-Beaumetz, in a late work,† calls attention to the fact that the new researches on the putrid fermentations of the intestines harmonize with and justify the traditional medication of our fathers. "Substitute, in fact, for the words *peccant humors, atro biliary* humors, the words *micro-organisms, alkaloids of putrefaction*, and you will understand the importance which the physician of the olden times attached to this group of medicaments, and you will better appreciate the language of the physicians of Molière's time, whose very phraseology the immortal comedian has transmitted to us in his 'Malade Imaginaire.' It was not, then, to expedite from the system the bad humors of M. Orgon that Fleurant employed the numerous apozemes prescribed by Purgon, but really in modern language to expel the putrid elements which had developed there."

The superiority of calomel over many other purgative medicines in such cases may be largely due, as Brunton suggests, to the fact that its antiseptic power is not as greatly diminished by admixture with fæcal matters as that of the other antiseptics.

Ives (Prize Essay, New Haven, 1866), who rules mercury out of therapeutics almost altogether, allows it a humble place as a cathartic "when torpor of the colon is presumed."

In dysentery, I have frequently witnessed marked improvement following a purgative dose of calomel; the stools for the time were more fæcal in character, the tormina and tenesmus were lessened. The routine treatment of acute dysentery adopted by some physicians, who give a calomel purge every

* "The beneficial action of mercurials in such cases may be partly due to their antiseptic power not being as greatly diminished by admixture with fæcal matters as that of other antiseptics" (Brunton).

† "New Medications," second edition, 1890, p. 96.

day till bilious, fæcal stools appear, is attended with good results; and, in fact, the frequent exhibition of mild purgatives in this disease till slime and blood disappear from the dejecta, and these have a more healthy color and consistence, seems to be the only rational and successful treatment. I have myself relied chiefly on castor oil or Epsom salts, only beginning the treatment with calomel. A favorite prescription with me in dysentery is castor oil one ounce, laudanum twenty drops, every second morning.

In chronic enteritis, the occasional administration of a calomel purge has proved of great benefit, and the chronic diarrhœa of adults, independent of serious organic change, with watery, pale stools, often yields, according to Ringer, to $\frac{1}{100}$ grain of corrosive sublimate every two or three hours.

In typhoid fever, a favorite plan of treatment, in the initial stages, with some practitioners, is to give, every other day during the first week, 7½ grains of calomel; if the temperature be high, this dose may be given every day. Liebermeister gives three or four ½-gramme doses during the first twenty-four hours of the treatment. "The diarrhœa at first increases, but soon subsides, and is afterwards less troublesome. In most, but not in all cases, the first doses are reported to have been followed by a distinct but transient lowering of the temperature."* The intent of practitioners who give calomel in these doses at the onset of typhoid fever is to obtain its full antiseptic action on the small intestine, to remove irritant fæcal matters, and especially to antagonize the specific microbes and their products.

It is difficult to decide whether or not any real benefit is obtained from calomel thus administered in the early stages of typhoid. To properly carry out this treatment, the patient ought to be seen from the first, which is not always possible, especially in private practice.

It should be mentioned that this mercurial treatment has been condemned by good authorities, as Dr. James Jackson and Dr. Nathan Smith; the latter says that he has seen very serious evils arise from it, and he recommends that the medicine shall be only occasionally used, and with opium, for the purpose of checking a colliquative diarrhœa.†

Yellow Fever; Bilious Remittent Fever.—Calomel is no longer prescribed in yellow fever in the small doses in which it was formerly administered, and, at most, a purgative dose early in the course of the disease is allowed (Corre, Stillé, Robert Jackson).

In bilious remittent fever, most authorities acquiesce in the conclusions formulated by Duncan: "I am of opinion that an endeavor to induce mercurial influence in remittent fever is erroneous in theory and of no value in practice." "If it be true," adds Stillé, "that prostration of vital actions and a deteriorated condition of the blood are pathological states to be much dreaded in remittent fever, and if mercury deteriorates the blood and favors prostration, on what principle of reasoning can it be supposed that induced mercurial influence can have any other than an injurious effect in remittent fever?" ‡

In the acute hepatitis of hot climates, the use of calomel has gone out of vogue, at least its administration, with a view to its constitutional action. "The repeated use of this medicine," says Stillé, "is known to induce a permanent derangement of the hepatic function, with disordered digestion and impaired general health." In chronic hepatitis, with induration of the liver and scanty secretion, mercury is sure to aggravate the lesions, and in cirrhosis it is worse than useless.

Mercury as an Alterative.—There is no doubt that mercurials (calomel, corrosive sublimate, protiodide) have been often prescribed as alteratives for very fanciful reasons; and when I see a popular text-book on gynæcology recommend the treatment of chronic metritis, and even ovaritis and salpingitis, by small doses of bichloride given for months, and when I see standard authorities on skin-diseases advise the same constitutional treatment for eczema, psoriasis, lupus, acne, and almost every chronic cutaneous affection, it is time fearlessly to assert that there is no scientific warrant for this profoundly anæmiating and debilitating medication.

CALOMEL IN FUNCTIONAL HEPATIC DERANGEMENTS.

It is hard to separate the functional disorders of the liver from acute indigestion and its sequelæ. Much of what has passed for *biliousness* would now be regarded as ptomaïne-poisoning, or the liver has been overworked and disabled in consequence of a surfeit.

The observations made by Beaumont more than fifty years ago on Alexis St. Martin

* James C. Wilson, "A Treatise on Continued Fevers." New York, 1881.

† Quoted by Stillé.

‡ "Therapeutics and Materia Medica," vol. ii. p. 703.

must still be cited (as they have recently been by Lauder Brunton)* in explanation of the phenomena of acute biliousness. After excesses in eating and drinking, Beaumont found St. Martin's stomach covered with livid spots and aphthous patches; the gastric secretions were mixed with ropy mucus; the digestion was slower than usual or suspended altogether. A little later the symptoms of biliousness were superadded. The usual appetite was gone; the tongue was covered with a thin yellowish coat. The countenance was sallow, and in the interior of the stomach were several deep-red patches. A muslin bag which had been introduced, with some food in it, in order to test the rapidity of digestion, when drawn out was covered with a coat of mucus and yellow bile. On the succeeding day, the coats of the stomach were still unhealthy, and of a deeper red than naturally, with patches of a still deeper color, and the mucous membrane abraded in places. This venous congestion indicated stasis in the radicles of the portal vein, and hepatic engorgement. Beaumont, who records several such instances in his book (pages 100, 118, 251, 270), states the benefit which, in one instance, was derived from a purgative dose of calomel, "which removed all the foregoing symptoms and the diseased appearance of the inner coat of the stomach." On another occasion, his patient was restricted from a full and confined to a low diet, and simple diluent drinks, with restoration *ad integrum* of the disordered viscera, and return of health and appetite.†

It will be seen that all this has been anticipated in a preceding paragraph (*vide* heading "Gastric Sedatives"). Between the hepatic functions and the gastro-intestinal there is a solidarity such that the derangements of neither can be intelligently discussed separately.

Although the bile acids themselves are sufficiently toxic when in excess in the circulation (see experiments of Harley, Feltz and Ritter, Graham, Brown, and others), and although it has been proved that these acids in jaundice have a speedily depressant effect on the nervous centres, being, indeed, violent cerebral poisons, yet *biliousness* in its common acceptation is a vague and indefinite compound of cholæmia, lithæmia, and stercoræmia; and, as factors in the causation of the morbid syndrome, we have mal-elaborated peptones and poisonous ptomaïnes. In this condition, the relief obtained by free bilious evacuations is most marked, but there is no evidence as to the superiority of calomel, or the old-fashioned blue pill, over purgatives (podophyllin, euonymin, Glauber salts, etc.) which, according to modern researches, are more specially cholagogue.

There is one evil attending the frequent use of calomel, taken "to regulate the liver," which I have noticed. It becomes after a time as much a necessity as the morning "pick-me-up" to the confirmed inebriate. "The frequent use of mercurials," says Budd [in functional hepatic complaints], "may lead to much mischief. When the liver has become accustomed to the stimulus of mercury, no other medicine will sufficiently excite its action. The person is thus led to the habitual use of the medicine, and after a time the constitution is undermined by it. It increases the activity of the liver at first, but seems to leave it weaker than before, and, if frequently resorted to, the nutrition of the patient, impaired by the original disease, is still further impaired by the drug."

In all such cases we should be content with milder medicines which increase the secretion of the liver without having any permanent deleterious effect on the system.‡

Chambers, who prefers the *pil aloes et myrrhæ* as an alterative to any mercurial, uses this emphatic language in his work on "Indigestions," page 49:

"I am particular in enlarging upon this point from the fear lest any language of mine should be construed as an encouragement to an unfortunate tendency towards commencing treatment habitually with destructive remedies. Some call this clearing the decks for action; in a majority of instances they may be said to throw overboard much of the best tackling on the ship and loosen her armor-plates. A so-called sluggishness of the liver is a frequent pretext. In a half-nourished person (and all invalids are but half nourished) the fæces are apt to be light-colored and scanty. Blue pill gives them immediately a darker hue and increases their quantity, but sadly at the cost of the patient's strength, while the temporary change soon passes off. But let the experimenter

* "Disorders of Digestion; their Consequences and Treatment." London, 1886, p. 27.

† Beaumont, "Physiology of Digestion." Burlington, Vt., 1846.

‡ Budd, "On Diseases of the Liver," American edition, 1846.

try meat and iron, and see if he cannot produce the same result."

In jaundice, due to impediment to the outflow of bile, cholagogue doses of calomel can do no good. In that produced by a congested state of the liver, there can be no objection to a calomel purge at the onset, but the general treatment by saline purgatives, alkalies, dieting, and rest will alone give satisfactory results.

MERCURIALS AS EXTERNAL ANTISEPTICS.

The utility of various mercurial preparations as local applications in certain skin-diseases, and as a part of the paraphernalia of antiseptic medicine, surgery, and obstetrics, is beyond all question. Mercury is *par excellence* the parasiticide, whether the pest be vermin, vermes, or microbes. Corrosive sublimate is unquestionably the best antiseptic and the most generally useful of these preparations. It is because mercury is such a foe to living matter that it is a good antiparasitic remedy, but it is, for the same reason, an internal medicament which must be given with caution.

But it is not my intention to pursue this topic, my object having been to discuss the uses of mercury in its application to internal medicine; and I shall briefly sum up what I have written in this and the preceding article:

1. Mercury must still take the palm over all other remedies in the treatment of secondary syphilis. Here the choice is between two evils; but the syphilitic poison is a greater blood-spoiler than mercury when judiciously administered; and, in antagonizing and destroying the virus of syphilis and preventing its ravages on the blood, mercury becomes a genuine reconstituent tonic. The mercurial treatment is not to be commenced *till the syphilis has declared itself*, and is to be instituted only in the secondary stage.

2. Mercury (under the form of calomel) has no place in medicine as an antiphlogistic or alterative, and its employment in fractional doses, in combating inflammations, whether acute or chronic, should be absolutely discarded.

3. Calomel has a limited usefulness in infantile therapeutics, but principally as a gastric sedative and as a thorough antiseptic cathartic.

4. Calomel is an efficient purgative, stimulating the secretions of the intestines and liver, and promoting intestinal peristalsis; it remains so long unchanged in the alimentary canal that it exercises a local antiseptic and sedative effect, and hence proves valuable in many morbid states of that canal. As a cathartic, it is good to clear the *primæ viæ*, especially when no other cathartic can be borne, owing to irritability of the stomach; in the onset of some inflammatory or febrile diseases it may have a useful depurative and even derivative effect.

5. In ordinary "bilious" complaints calomel has a place which is entirely subordinate to other more rational and hygienic modes of treatment.

IODOFORM IN CHRONIC EYE CONDITIONS.

By G. Walter Barr, M.D., Keokuk, Iowa.*

THE use of iodoform as a dry antiseptic dressing has always had a tendency, in my hands, to produce exuberant granulations. This suggested the use of the same substance in cases where it is desired to stimulate cell-growth, and naturally some chronic conditions of the eye offered an attractive field for investigation.

It seemed evident that to attain antisepsis and the stimulating effect of the drug, seen in open wounds, it must be continually kept in contact with the part; this ruled out of the question the almost discarded use of iodoform pencils as rapid, repeated applications; the pure iodoform is much too irritating for use in the eye; and an ointment of proper strength best fulfils the conditions. The strength of the ointment should vary with the amount of stimulation desired and the susceptibility of the eye, for there is an individual factor of susceptibility which is far from constant. From 1 to 5 grains of iodoform to the ounce of vaseline has been found most often of greatest use. *En passant*, it is hard to find vaseline now which is free from some irritating substance (probably acid) left in it in the process of refining. This applies to unguentum petrolei, under whatever trade-marked name it is sold.

The first case in which I used the iodoform ointment was a girl aged 15, who had barely light perception in one eye and an anterior staphyloma in the other. There had been conjunctivitis from infancy, and the entire cornea was opaque in the eye which did not have the staphyloma. Before operating on the latter, it was highly desirable to get the best possible vision in the other eye. The

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ordinary practice had been exhausted, and a 4-grain iodoform ointment was placed in the eye three times a day. In a fortnight the vision was perceptibly improved, and in three months she could count fingers. This eye never got much better, perhaps partly due to a pathological condition of the optic nerve from a long disuse,—from early infancy,—although the cornea became gradually clearer. The staphyloma was operated upon, leaving a triangular piece of cornea, about 1.5 millimetres in dimensions on each side, and an iridectomy performed behind it. The corneal remnant at once became opaque in the process of healing; there was total blindness in the eye. A 4-grain iodoform ointment was applied twice a day, sufficient being placed on the everted upper lid to last until the next application. In three months the corneal remnant had so cleared up that she could recognize faces in her limited field of vision. I have never had any but the most gratifying results in treating pannus, however deeply the cornea is affected, by the use of iodoform ointment; the sight has not always been completely restored in the worst cases, but vision has been doubled or improved even more. The length of the period of treatment seems to be in direct ratio to the age of the pannus, but several months are nearly always required in cases of long standing. The ointment should be applied often enough to keep the cornea constantly covered with it.

In trachoma, the efficacy of iodoform ointment depends on the amount of stimulation required and the strength of the ointment. By varying the strength of the ointment, it seems to me that greater nicety of effect can be obtained than in any other way. Trachoma of years' standing with large granulations, which are best adapted to the compression treatment, quickly succumbs to a 4-grain ointment, applied twice a day. In trachoma and chronic conjunctivitis the iodoform ointment may be used to advantage in conjunction with other treatment, where stimulation is not contraindicated, by applying it at bedtime; the result is a cessation of the gummy or pustulating condition of the lids in the morning.

In indolent ulcers, the results have been as encouraging as in pannus. Sometimes it has been necessary to touch the ulcer with cupric sulphate, but in two cases nothing but the ointment was necessary. In all the ulcer healed much more rapidly when the iodoform ointment was used, and usually without cicatricial cloudiness. Continued use of the ointment soon removed all marks of the ulcer and left the cornea perfectly clear.

The above is a generalization of the results in over a hundred cases of trachoma (mostly of very long standing), thirty cases of pannus, and a dozen cases of corneal ulcer. They seem to me to justify a further trial by others. The points to be remembered are, that much depends on a proper strength of ointment in each case, and that it is not adapted to acute conditions.

Regarding the *modus operandi*, those who are not confirmed microbmaniacs will attribute the action to the cell stimulation seen in the use of iodoform in chronic ulcers and like conditions. Of course, in trachoma and chronic conjunctivitis, something may be due to the antiseptic action of the iodoform, but hardly in pannus, or, perhaps, in corneal ulcer.

STANDARDIZED VEGETABLE DRUGS AND GALENICAL PREPARATIONS.

A QUESTION OF THE DAY.*

By F. E. Stewart, M.D., Ph.G., Wilmington, Del.

I TAKE it for granted that I am addressing an audience whose desire is to find out the actual merits of the important subject forming the title of this paper. I also take it for granted that you are all good and patriotic citizens, and therefore care more for the interests of humanity, as represented by the people of the United States, than you do for your personal interests from a purely selfish point of view. As true professional men, engaged in practising medicine or preparing the same, your allegiance is to the cause of suffering humanity, and you will and do make all other causes secondary thereto. But, even from a selfish point of view, the physician must seek first the interest of his patient, and select such medicines as shall promptly act as remedies in the case, for only by so doing is reputation secured and that monetary reward which results from an increased public patronage. The same remark can be applied to the pharmacist, for it is the long headed pharmacist who, from a selfish point of view, seeks to gain reputation and increased trade by serving the public with the very best that the market can afford. There is a narrow selfishness, however, exercised by a narrow man, whether he be a pharmacist or a "don't-care

* Read before the Medical and Surgical Society of Maryland.

doctor," who, looking for money only, employs the cheapest product that the market affords, the only question with him being the cost and the selling price. This is a very short sighted policy, but it is unfortunately found, however, in the unprofessional, uneducated, and unthinking physician, and in the case of the druggist who sees in his vocation no responsibility and nothing but an opportunity for gold.

I do not suppose for one moment that I am addressing an audience which contains a single person of the kind that I allude to.

It is my purpose, therefore, to present this subject from a broader point of view, in the light that I see it as a physician and graduate in pharmacy, and as a teacher both in medical and pharmaceutical schools. I recognize, however, that I am addressing an audience of my peers, and I have no doubt that some in this room may see the subject in a very different light than I do. I hope such will not hesitate to express their views in the discussion which, I presume, will follow the reading of my paper. I am here to learn, as well as to give you my own ideas, and it may be that we will all modify our own views by a frank exchange of opinion.

The standardization of vegetable drugs and Galenical preparations has become one of the leading questions of the day. This question is being argued from all points of view. Some are arguing from the broad platform of professional character, others from the narrow platform of selfishness. Let us to-night weigh these arguments for what they are worth, and consider the motives of those who offer them.

First.—What is meant by standardizing vegetable drugs and Galenical preparations? It is to assay them chemically, so that physicians may have placed in their hands preparations of vegetable drugs which, instead of varying greatly in strength as at present, shall conform to a fixed and definite standard. It is proposed that tincture of nux vomica, for example, shall conform to a certain standard of strength, and not be made of one strength to-day and another strength to-morrow; for it is a fact now that a physician never knows what strength is furnished his patients, and therefore is uncertain regarding the effect of medication.

Because opium varies in morphine from 2.48 per cent. in samples of the drug from East India, to 22.88 per cent. in a fine quality of French opium, the Committee for Revising the United States Pharmacopœia deemed it best to publish a method of assay in the Pharmacopœia, whereby opium can be assayed and standardized preparations made therefrom. Because cinchona varies in alkaloidal strength from 135 per cent. in some specimens down to less than one per cent., the committee, in a subsequent revision, inserted a process in the Pharmacopœia whereby cinchona can be assayed and the preparations made from it can be standardized to a certain strength. Now, as belladonna-leaves vary in alkaloidal strength from .010 to .050 per cent., and the root from .25 to .60 per cent., and nux vomica contains from one-fourth to one-half per cent. of strychnine, the friends of standardization, seeing how well it works in the cases of opium and cinchona, ask to have it extended to belladonna and nux vomica.

But there suddenly appears an opposition to any further extension of standardization. The opponents say that the scheme is impractical and injurious; that its adoption will ruin the retail drug trade of this country, by raising the standard of the Pharmacopœia above the ordinary pharmaceutical ability, and throw the manufacture of Galenical preparations into the hands of the large manufacturing houses, etc.

Let us take up these arguments one by one and examine them. First, Has the adoption of standards for opium and cinchona in the Pharmacopœia raised the standard of this work above ordinary pharmaceutical ability, and vested the manufacture of opium and cinchona preparations in the hands of the manufacturing houses to the injury of the retail drug trade? If it has not done so, is there any reason to suppose that the extension of standardization to belladonna and nux vomica will effect the manufacture of preparations from these drugs any differently? If not, where is the line to be drawn where standardization will commence to have such baneful influence on the retail drug trade?

But suppose, for example, that the adoption of standards for every drug containing characteristic active principles in sufficient amount to admit of assay were introduced into the United States Pharmacopœia, and the result was to throw the manufacture of Galenical preparations into the hands of the larger manufacturing houses, thus taking it away from the retail druggists, how could anybody be so cruel and selfish as to ask that the cause of suffering humanity should be sacrificed to benefit the retail trade? Even if an attempt were made in such a case

to block the wheels of progress that the retail drug trade should profit by the suffering of their fellow-man, how long would the block stand? It would be like the wall of sand the children erect on the beach to block ocean's rising tide. No, I will not do an injustice to the retail drug trade of this country by leaving my argument in a form where it may be said that I charge such selfishness to the retail druggists. I believe that I say truly when I claim that the retail druggists, as a class, are above such a level as this.

Yet I heard an argument one time by a pharmacist that makes it appear that there are those who would be guilty of the very act I refer to. This gentleman said that he was in favor of standardized drugs, but not in favor of standardized Galenicals. In other words, he will not oppose a plan whereby the wholesale druggist shall be required to sell drugs of standard strength, but he will oppose a plan whereby the retailer is forced to test the accuracy of his manipulations applied to the same drug in its manufacture by assaying the finished preparation of it. If the retailer buys opium, cinchona, belladonna, and nux vomica of standard strength to commence with, it is enough; and he should not be required to furnish any guarantee that he has extracted the activities of the drug by testing his finished preparation. Surely any one who has had much experience in manufacturing knows that failures in this connection are not an uncommon thing. The only way to be certain that a preparation is up to the standard is to assay it; for, no matter how carefully a drug has been assayed, its strength may deteriorate, unless great care is taken to store in sealed packages and keep at a uniform temperature; or careless manipulation may result in failure to extract all its virtues.

Now, I do not wish to argue against druggists purchasing standardized drugs. What I do say is, that the only sure way is to purchase standardized drugs in the first place, and standardized finished preparations afterwards. In case the latter test alone was relied upon, druggists would be the losers frequently, for they would often pay first-class prices for weak drugs, and thus be out of pocket in the end on account of the larger amount required to bring the preparations made from them up to the standard.

What the gentleman referred to is afraid of is that the retailer who attempts to standardize his Galenical preparations cannot compete with the manufacturing houses, and he is willing to sacrifice the cause of suffering humanity for the retail druggist. But I think this difficulty is more apparent than real, for the preparations admitting of such tests are, as a rule, from narcotic drugs which are sold only in comparatively small quantities, and their dispensing is limited almost exclusively to physicians' prescriptions, so that the expense of assay would make but little difference in the cost; while, on the other hand, the increased prescription trade resulting to druggists adopting such improved methods would more than make up the difference.

And in this connection another thing must be considered, and that is the following: Much of the drug business of the past has unfortunately consisted in selling patent medicines, soda water, and fancy goods. This business is rapidly drifting away from the retail drug-store, and will continue to drift, in spite of all means taken to prevent it. Furthermore, this kind of business is not the practice of the profession of pharmacy. It is not for this that pharmacists spend years of study and graduate in pharmacy. For a merchant service of this kind a business college is far better training than a college of pharmacy. Now, I believe that any plan which elevates the practice of pharmacy above that of a petty shopkeeper to the true dignity of a liberal and educated scientific profession should be encouraged. This standardization has a tendency to do, for it raises the standard of pharmaceutical practice to a much higher level.

My argument is in behalf of the retail druggist in his true vocation of scientific pharmacist and member of a branch of service which must be regarded as a medical specialty, and which should rate him as the equal of the physician in every respect, provided his education has been equally liberal and comprehensive.

Now, suppose the pharmacist prefers to buy Galenical preparations rather than to make his own, then what is the state of the case?

Of course in this case he should test the Galenical preparations he buys. But the opponents of standardization say that this he will not do, and this he cannot do.

In regard to his will not do, this is a question that each individual must settle for himself. He buys his inorganic chemicals on faith from the manufacturer, and no one charges him with foolishness. Will any one say that the manufacturers of inorganic chemicals are more honest than those who

manufacture preparations of drugs belonging to the vegetable kingdom.

In regard to his incompetence I have evidence to prove that the retailer who is not already competent can make himself so without great expenditure of time and money.

Surgeon Mew is the government chemist, employed by the United States army for assaying the drugs and preparations used by the medical department of this branch of the national service. He has been engaged in his vocation for seventeen years. During that time his experience has been very great. While attending the Convention for Revising the United States Pharmacopœia in May as a delegate from the Medical Society of Delaware, I called on Dr. Mew to ascertain the amount of apparatus and knowledge necessary to test Galenical preparations. I found Dr. Mew busily engaged in his laboratory, situated in the Army Medical Museum, and the following is what he told :

"In the first place," said Dr. Mew, "the apparatus required for this work is neither extensive or expensive. You see how simple it is, for it is all before you. In the second place, the knowledge required is not difficult, nor does the manipulation require special skill. Much of my work is done by a soldier that I have trained for the purpose, and I will guarantee to teach any person of ordinary pharmaceutical ability to do the work well in six months. As to the practicability of carrying on such a work, my experience is sufficient proof. I have been engaged in it for seventeen years, and we test here every Galenical preparation containing principles that can be recognized and existing in sufficient quantities to admit of assay. Often the medical purveyor changes the mark, and sends back the same preparation again and again to test the accuracy of our results; and the trial only proves that our results can be relied upon. As to the necessity of assay, you will not doubt it when I tell you that preparations made by the best houses in the country are sent to us absolutely devoid of activity. Such cases prove that the most conscientious manufacturer, who carefully selects his drugs and uses the most approved method for preparing it, cannot depend on his results, owing to the varying amount of activity present in medicinal plants, owing to soil, climate, and season of the year when gathered."

In response to the question, How would you detect the fraud if some cheaper alkaloid were put in as an adulterant in place of a more expensive one? Does not Mayer's reagent throw down one as well as the other? he said, "I always test my precipitate for identity. Any chemist would do that. But I have yet to find a single instance where such a fraud has been attempted."

A great deal more could be said along this line, but I have already taken up much of your valuable time. There is one point, however, that I wish to cover, which is very important, and which you should thoroughly consider. It is this: There are two classes of persons opposed to standardizing vegetable drugs and Galenical preparations. The first class argue against it from the purest of motives. Some of this class are gentlemen of a great deal more knowledge and ability than I possess. These gentlemen are chemists of high repute. Some of them consider the whole scheme of standardization impractical and visionary. To such I wish to say that until they can upset the following evidence, I shall remain on the side of those who believe in it. The evidence is—

1. That of Surgeon Mew, government assayist, who has practised assaying for the army medical department for seventeen years, and who declares it perfectly feasible.

2. The evidence of such excellent concerns as Messrs. Gilpin, Langdon & Co., of your own city, a firm you all know and respect. This house is doing a large trade in assayed vegetable drugs, and the assays are made in its laboratory, where the chemist of the house has been engaged in this work for years.

3. The evidence of Messrs. Parke, Davis & Co., of Detroit and New York, which house manufactures a line of standardized Galenical preparations called normal liquids, which are coming into favor all over the United States and Europe.

4. The United States Pharmacopœia, with its assayed opium and cinchona.

This evidence represents some of the best chemical talent in the land. What are you going to do with it? There were learned men in the times of Columbus who called him impractical and visionary, but the great American nation of to-day is a tribute to his genius and a monument to their shame.

There is another class which objects to the adoption of further standards for drugs and Galenical preparations. The class to which I refer is not honest in its objections. The true reason why it objects is because standardization is being pushed by wholesale druggists and manufacturers, who must of neces-

sity gain the commercial prestige resulting from the suggestion and adoption of such an important proceeding. This class argues that anything that comes from a "trade source" must be received *cum grano salis*. It is a class that scoffs at the idea of elevating pharmacy to the dignity of a profession. It calls the pharmacists "a lot of vile tradesmen and counter-jumpers," and refuses to give them any scientific or professional recognition. Some of the class edit and publish medical journals. These are often the most bitter. They say if pharmacy is recognized as a profession, then the pharmacist will ask space in their journals for the publication of scientific articles on pharmaceutical subjects. Everything relating to medicine from such a source is advertising matter, say they, and can only appear in our advertising pages, where it must be well paid for. This class will doubtless attack me for addressing you on what it is pleased to call a trade subject. I wish to say that I thoroughly appreciate the motive, and call your attention to the existence of a class of opponents who are, as it were, overturning heaven and earth in their mad effort to prevent further progress in this direction. As for me, I say all honor to these great commercial houses who are doing so much for the cause of science, the profession, and humanity. When any individual or concern invents a new thing, or makes a valuable discovery, and publishes exact knowledge of the invention or discovery for the benefit of science, whereby others are permitted to use this knowledge freely, I claim that such individual or concern should receive due credit therefor; that the knowledge is not advertising matter, but scientific literature; and I also claim that any refusal to give credit when it is due, and to prevent such publication of knowledge that it may only appear in the advertising columns of medical journals at the expense of the inventor or discoverer, is an outrage on humanity and a hinderance to the advancement of science and professional progress.

There is another class of objectors a little hard to classify. This class numbers professors in certain colleges of pharmacy, who, while more or less favorably disposed to standardization on general principles, oppose it through fear that its adoption will throw manufacturing still further into the hands of large manufacturing houses, and do away with the profession of retail pharmacists altogether. To such I would suggest that standardization offers a cure for the very evil referred to. As things are now drifting, the retailer is having a very "hard row to hoe." The manufacture of inorganic chemicals has long been vested in the large manufacturing houses of Powers & Weightman, Rosengarten & Son, etc.; physiological therapeutics has reduced drug-giving on the part of physicians to a comparative minimum, and ruined the prescription business; the cutters have entered into competition in the sale of patent medicines, and taken all the money out of that trade; and now somebody comes along, say they, and suggests a plan to rob the retailer of what little there is left. Then what will become of the colleges of pharmacy, and what will become of us? I am sorry for these gentlemen. I can, indeed, sympathize with them, for, as a pharmaceutical teacher and author, I am in the same boat with them. But, gentlemen, any attempt on our part to block the wheels of progress will only result in disaster to ourselves. The demand for physicians, druggists, and medicine in this country is limited, though large. For years the patent medicine trade has used every endeavor that capital, executive ability, and misleading advertising can accomplish to seduce the public from its allegiance to legitimate medicine. It is competition between scientific medicine on the one side and quackery on the other. The former cannot promise cures. Though it has done much to alleviate human suffering, it has not yet conquered consumption and other terrible diseases. But quackery promises anything and everything, and by a system of misleading advertising, whereby cures only, not failures, are reported, apparently backs up its bombastic pretension. The medical profession has seen the growth of its giant evil, which has been ruining legitimate medicine for years, and has used many endeavors to remove it. But the patent medicine trade has at last so thoroughly subsidized the entire press of the country, medical, secular, and religious, that it is silent on the subject. Without the support of the press, methods of reform are slow indeed.

But pharmacists, just so long as they made a fair profit in selling proprietary medicines, refused to heed the warning that they had taken a viper into their bosoms, which would sting them at last. The cutters came, the profits were cut off, and now there is weeping and wailing all along the line.

As I said before, I see in this question of standardization a remedy for the evil. It may not be a cure,—remedies are rarely that,—

but it will afford great relief. Insist on the standardization of every patent and proprietary medicine. How can that be done, and what good would it do? you say. It would absolutely destroy secrecy, and that would be a death-blow to a large number of these vaunted cures. Time will not permit me to go into details regarding the plan. My idea, carried out in full, is to pass and enforce laws which will prevent anybody from making and selling medicines unless properly qualified to do so, instead of having things in the position they are now in, whereby any ignoramus can mix up and sell any kind of a compound he chooses, and advertise it as a specific for disease. It includes the passage of a national law to prevent the transit of adulterated products from State to State, and State laws to stop the sale of adulterated products in each State. To discriminate what is meant by adulterated medicines, and to define what are below standard, and therefore unfit to sell, standards must be established. When applied to patent medicines, the standard to be adopted is that of the original formula. This requires its publication, destroys its secrecy, and removes in great measure opportunities for fraud. My plan, by throwing the entire manufacture and sale of medicine into the hands of educated pharmacists and destroying secrecy in medicine, would be a great relief to both physician and pharmacist, and of immense benefit to the American people. My plan includes a government laboratory at Washington or elsewhere, under charge of the medical department of the army, navy, and marine hospital service, and an investigation of the materia medica of the world under such auspices. I merely speak of it in this connection to suggest possibilities, and refer you to my paper on the subject, read before the Ninth International Medical Congress, entitled "A Proposed Investigation of the Materia Medica of the World, under the Auspices of the United States Government; a Plan to Promote Progress in the Science of Drugs" ("Transactions of Ninth International Congress," vol. iii. p. 10).

TREATMENT OF TUBERCULOUS BRONCHITIS BY HYPODERMIC INJECTIONS OF IODOFORM.

Influenced by the action of iodoform on pus globules, Dr. Gavoy announces in the *Gazette Médicale de Paris* for February 28, 1891, that in 1887 he was led to test this remedy in pill form in tubercular bronchitis, but the gastric distress and nausea caused by the administration of the remedy compelled him to substitute enemata for the internal administration in the pill form, and he has now for various reasons substituted for these methods the hypodermic method. He states that at the outset he employs, morning and evening, a hypodermic injection of a quarter of a syringeful of a solution of 1 part of iodoform in 100 parts of oil of sweet almonds. In very few cases, he states, is any febrile reaction produced, and the results obtained in the majority of cases are excellent. He maintains that in his use of this remedy the cough rapidly diminishes; muco-purulent expectoration, so characteristic of this specific catarrh, becomes more fluid, and finally ceases almost entirely; alteration in the character and hoarseness of the voice disappear; the lungs become more permeable to air; inspiration becomes deeper; the vesicular murmur acquires another character, and subcrepitant moist râles disappear, nocturnal sweats cease, the appetite returns, and the patient's general health improves. In fact, he states, that progressive improvement in the majority of cases indicates in the most positive manner arrest of this broncho-pulmonary catarrh of phthisis. He states that the examination of the sputum for bacilli is not an indispensable criterion for this therapeutic process, for the presence of the bacilli can only be exceptionally located at the onset of tubercular bronchitis, and, although the bacilli may exist in small closed cavities in the lungs, they only appear in the sputum when the ulceration has communicated with the bronchi. Further, iodoform is said to have the power of liquefying the more or less solid obstruction in the alveoli. He suggests that the therapeutic action of iodoform on caries of bone and on pus globules permits of the supposition that it may exert an analogous action on yellow tubercle and during the stage of softening, a condition which might be described as a caries of the lung. Although iodoform is an active antiseptic agent, it does not appear to have any direct action on the bacilli of tuberculosis other than in modifying the character of the tissues in such a manner as to delay or prevent the reproduction of the bacilli, and in aiding the elimination of the results of tissue breaking-down, and favoring the cicatrization of ulcers seated in the alveoli. He recommends in the warmest terms further tests with this remedy in this connection.

The Therapeutic Gazette

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Medical Publisher, Box 470,
DETROIT, MICH.
Philadelphia, 714 Filbert Street.

SUBSCRIPTION RATES FOR 1891.

(Journal increased to 72 pages each month.)

THERAPEUTIC GAZETTE (postage included).....$2.00
THERAPEUTIC GAZETTE with MEDICAL AGE..... 2.50
THERAPEUTIC GAZETTE with AMERICAN LANCET 3.25
THERAPEUTIC GAZETTE with AGE and LANCET... 4.00

Foreign subscriptions may be ordered through our agent in England, Mr. H. K. Lewis, Medical Publisher and Bookseller, 136 Gower Street, London. Price 10s. Remittances may be made either by Postal Order or Stamps.

Price to Foreign Subscribers direct (postage included), $2.50 (10 shillings). English postage-stamps received on remittances.

Editorial communications should be addressed 332 South Twenty-first Street, Philadelphia. Articles intended for the Original Department of the GAZETTE will be accepted only with the understanding that they are contributed to it exclusively.

Authors will receive reprints in pamplet form, without charge, provided the request for them be written on the articles sent.

Business communications should be addressed to the Publishers.

Leading Articles.

THE PROPERTIES AND USES OF GELSEMIUM SEMPERVIRENS.

GELSEMIUM, by reason of its alkaloid gelsemine, is a powerful poison of the cerebro-spinal system, also of the excito-motor ganglia of the heart and respiration. The motor part of the spinal system seems to be especially influenced by toxic doses. Under the action of this drug, both cold- and warm-blooded animals become inert and torpid, and, at a more advanced period, paralyzed. There are, first, fibrillary movements and tremblings of the muscles, then tetanic movements, which put the limbs in forced extension, last but a short time, then, after a season of repose, come on again. These tetanic movements, by virtue of the rhythmical pauses alluded to, differ from the tetanus produced by strychnine; they are, moreover, preceded and accompanied by a loss of reflex power and by respiratory embarrassments, which still further differentiate them from the tetanic movements of strychnine.

In the THERAPEUTIC GAZETTE for August, 1886, page 550, are also presented Raimondi's comparative investigations, showing how the tetanic spasms of the one drug differ from those of the other. According to this writer, the effects of strychnine manifest themselves with equal intensity over the whole body, while in gelsemium-poisoning the posterior extremities show the clonic-tonic convulsions more distinctly than the anterior ones.

According to Berger, gelsemine has but little action on the sensibility. Noritz has, however, noted anæsthesia after the period of trembling. Berger affirms that it paralyzes the motor centres, diminishes the excitability of the peripheral motor nerves, and causes death by paralysis of the pneumogastric. Most experimenters, however, maintain that death results from paralysis of the respiratory motor ganglia, taking place in the midst of asphyxiating convulsions.

There have been numerous cases of poisoning by this drug; to many of them we have referred in former numbers of this journal (see THERAPEUTIC GAZETTE, 1885, p. 655, also 1890, p. 481). Among the symptoms which have been noted in the human subject are headache, dizziness, double vision, numbness of the fingers, difficult respiration, ptosis, and difficulty in moving the eyes or tongue. Reflex excitability is suspended, the pupil is dilated; at a later stage, the sensory columns of the cord are paralyzed, complete anæsthesia resulting. The toxic action of this drug is also manifested by coldness and a marked fall in the temperature, due, it is said, to slowing of the heart and depression of the circulation.

There is nothing in the physiological or toxic properties of gelsemium that directly suggests its therapeutic uses. Experiments on animals only indicate the most palpable lesions and disturbances of function, and teach toxicology rather than therapeutics. Nevertheless, when physicians have learned the toxic properties of drugs, they are the better prepared to test the effects of these drugs in small, safe doses in the sick. It might be inferred that any medicine which in so marked a degree as gelsemium affects the motor and sensory tracts and centres might be useful in modifying certain spasmodic and painful conditions. Such has been proved to be the case. More than one clinical experimenter has found gelsemium serviceable in combating local spasms. One of the latest instances is that of Dr. Imogene Bassette, as reported in the *Journal of Nervous and Mental Diseases* for June, 1890, and referred to in the THERAPEUTIC GAZETTE for July of the same

year. The case was one of spasmodic torticollis, the spasm being very severe in character, and obstinately resisting all the ordinary means of treatment. Notable improvement followed the use of large doses of the fluid extract of gelsemium, 13 minims every two hours, night and day; the uncomfortable symptoms experienced were, for a part of the time, headache and double vision.

A number of cases are on record of painters' tic, of pianists' cramp, of tetanoid contractures, which have been cured by the persevering use of moderate or pretty large doses of the fluid extract of gelsemium. Its efficacy, even in chorea, has been affirmed by Heroguelle. He would, however, be a hardy man who, in a disease so long and so obstinate, would rely on the continuous use of so heroic a remedy.

Dr. John B. Read, in the *British Medical Journal*, 1882, p. 1245, reports a case of tetanus cured by the fluid extract of gelsemium, given in 40-drop doses every two hours till subsidence of the symptoms, then in half that amount every two hours for several days. This patient took half a fluidounce a day for a whole week.

Gelsemium has been somewhat in use (if we mistake not, by certain eclectics) as a febrifuge, 1- or 2-drop doses of the tincture being administered every two hours. Its antipyretic action is, however, altogether too variable to warrant its use in fevers, and it is altogether probable that it does not produce any fall in the temperature, except through a depressant action on the heart and circulation, so that there is nothing to be gained by substituting this drug for the more certain and manageable antipyretics.

Gelsemium has been recommended for its efficacy in intermittent fever (J. D. Gaughey, in *Phila. Med. Times*, March 7, 1874), but surely the circumstances will be very few and far between that will call for the administration of this remedy in fever and ague, to the neglect of quinine and other of the specific remedies of this disease.

It is in neuralgic affections, and particularly in facial neuralgia, tic douloureux, and inferior dental neuralgia, that gelsemium has manifested the most signal therapeutic efficacy. We might, had we room, cite a long list of clinical authorities, in this country and abroad, who have found gelsemium a most efficient, if not always safe, antineuralgic. The dose is from 2 to 20 drops of a saturated tincture, or of the fluid extract, repeated every two or three hours, till the pain is controlled. There is great variability in the strength of different preparations, and this is perhaps the reason why some practitioners have had no success with gelsemium. It is, of course, best always to begin with a small dose, and to feel one's way along to the dose which is required.

According to Dujardin-Beaumetz, gelsemium and gelsemine merit a place as antineuralgic medicaments far below aconite and aconitine. That this remedy has sometimes been followed by remarkable results in the treatment of facial neuralgia, and neuralgias of the paroxysmal or intermittent form, he freely concedes. He has, however, "found it an uncertain medicament." The tinctures and extracts "were of no definite and uniform strength, a fact due probably to the circumstance that in making the fluid preparations all parts of the plant, as well as the root, were used, or possibly because pains were not always taken to obtain the fresh, green root; as a consequence, the same doses sometimes gave toxic effects, sometimes no effect at all." This clinical experimenter has abandoned in the treatment of neuralgias this drug as uncertain and dangerous. These inconveniences, he says, might be avoided by the use of gelsemine, but this alkaloid is yet but little known, having not been sufficiently studied, and seems much inferior as an analgesic to aconitine.

ON THE TREATMENT OF CHRONIC INDOLENT ULCERS.

CHRONIC ulcers are generally situated over the tibia, about the middle or lower third of the inner aspect of the leg. They are "callous" ulcers, with thick, hardened, almost cartilaginous borders and edges, with a sunken, pale, and dusky base; there is absence of florid granulations, and the secretion is then and often offensive. The indications for treatment of these ulcers, whose vitality has always been greatly compromised by chronic inflammation, are the following: To subdue inflammation and stimulate the cells of the part to new activity; to restore the normal circulation; to soften the indurated tissues which oppose cicatrization; to combat and destroy micro-organisms, which luxuriate in the part and keep up inflammation and necrosis; to remedy any existing dyscrasia, and fortify the constitution of the patient.

We shall not presume, in an article which

must be brief, to take up these indications in their order; any mode of treatment to be successful must aim to more or less meet them all. Sometimes granulating action is best promoted by stimulating astringent and antiseptic lotions, such as the *red wash* (sulphate of zinc, two grains; rose-water, one ounce), *liquor acidi carbolici* (a two per cent. solution), the *lotio nigra*, solutions of salicylic acid (one drachm to the pint), of tincture of myrrh (one drachm to four ounces of water), of nitric acid (one drop to the ounce of water), etc. "In a healthy sore," says Dr. W. Alexander, "where there is no mechanical obstruction to cicatrization, the lotion most rapid in producing the desired effect is chloride of zinc." An antiseptic chloral lotion (chloral, one drachm; water, four ounces) is highly commended by Dr. Dowse, of London.

In many cases which are not too far advanced, the mere fact of keeping out offensive microbes will often cause a healing process to start; here the use of a corrosive sublimate lotion, of dry calomel, as a local application, or simply dusting the sore with iodoform, and covering with antiseptic gauze and a simple roller, will be at once attended with the formation of healthy granulations and a contraction of the margins of the ulcer.

Should indolent ulcers ever be poulticed? Theoretically, poultices might be expected to fulfil several important indications, and instances will repeatedly occur when they will prove beneficial. Sometimes the indolent ulcer is irritable and needs soothing, and a linseed poultice is the best application; and always where it is desirable to produce active determination of blood to the part, and increase the formation of vessels and cells, poultices may advantageously be used, though the continuous warm bath, as recommended by Billroth, is even better. We thereby obtain an artificial swelling and softening of the dry, hardened borders of the ulcer. Zeis, who has often employed the warm-water bath in callous ulcers of the leg, also recommends this treatment as one of the most efficacious in such cases.*

The indolent ulcer generally refuses to heal on account of mechanical obstacles to cicatrization; the blood-vessels of the part are distended and toneless, if not atheromatous; the tissues are œdematous and swollen; the veins, it may be, are varicose. Here pressure judiciously applied is the indispensable means of cure. In all text-books a prominent place is given to a system of strapping, first devised by Baynton in the latter part of the last century; the adhesive strips are cut from an inch to an inch and a half in width, and long enough to extend about three-fourths around the limb, each band being so arranged as to overlap that which is below it, and drawn so firmly as to afford uniform support to the affected surface.

It was found that serious disadvantages attended this mode of treatment. The dressings had to be frequently removed, otherwise the pent-up discharge became very offensive. Dr. J. Gordon Black several years ago proposed a modification of the Baynton dressing, which has been quite successful; certainly, for varicose ulcers, no treatment could be better. For plaster, he uses the *emplastrum saponis*. This is first warmed by being passed through hot carbolic-water. "The sore, after being washed clean by the patient, is then saturated with weak solution of carbolic acid and the straps applied. The pieces of plaster should be two inches broad, and long enough to overlap four inches after passing completely around the limb. They should be applied after the manner of a 'Scot's dressing,' from about three inches below the lowest diseased surface to about the same distance above the highest. In their adjustment it is important to use no compression, but simply to lay them down evenly, so as to fit the limb accurately, and leave no creases in the plaster. Should pain be produced, the strap has been improperly applied, and should be at once removed. The bandaging of the limb lightly and carefully from the toes to the knee finishes the dressing. The patient may be told to return at the end of a week, when, on removal, the plaster will show only a slight moisture, instead of the profuse and offensive discharge seen when no antiseptic is used." †

Under this treatment, says Dr. Black, the horny edges of the callous variety quickly disappear, without recourse to such a dangerous excitant as blistering (a method recommended by Home, Cooper, and other of the older surgeons). In eight or ten dressings, even very extensive ulcers may be healed by strapping.

Mr. Nourse, a surgeon of Brighton, reports great success from strapping and bandaging, according to this method. ‡

On this principle (that of keeping up uniform pressure) it has been proposed to treat

* Billroth, "Surg. Path.," p. 399.

† "Braithwaite's Retrospect," Part lxviii. p. 195.

‡ *Brit. Med. Journ.*, May 31, 1873.

indolent ulcers by means of sheet leads, as in the plan described by Dr. Atkinson in the *Practitioner*, May, 1879. A piece of sheet lead is moulded to the leg, and kept on by an ordinary calico bandage. The size of the lead should be sufficient to cover the sore completely and lap a little over the whole skin; the edges and angles should be well rounded, so as not to chafe and irritate; it should be about an eighth of an inch in thickness, and moulded very accurately to the shape of the leg, so as to allow of no indent being apparent on the surface. After it has been carefully fitted, the leg should be carefully bandaged from the toes upward. The ulcer is uncovered night and morning, and a little weak sublimate water allowed to trickle over it.

Dr. Watson, in the *Boston Medical and Surgical Journal*, utilizes sheet tin for the same purpose. The dressing is known at the Boston City Hospital as the "tin dressing," and its method of application is as follows: The ulcer and surrounding surface are soaked in corrosive sublimate, 1 part to 4000, and thoroughly cleaned. A bit of protective is then placed on the surface of the ulcer, extending a little beyond the margins of the ulcer; oiled silk will answer the purpose. The tin, made to fit the surface on which it is to lie, is then placed on the protective, and the whole, as well as the surrounding tissues, covered with a dry corrosive sublimate gauze dressing, which is held in place by an evenly-applied bandage, extending from the toes to the knee. Ulcers, which have been for a long time lagging, will often take a fresh start under this dressing.*

The treatment of indolent ulcers, and especially varicose ulcers, by the Martin rubber bandage, deserves mention, as being a very popular and very successful method. This treatment consists in applying a solid rubber bandage to the limb affected before the patient gets out of bed in the morning. It is not necessary that there should be any application between the ulcer and the bandage. The bandage is put on with just the requisite degree of tightness to prevent its slipping down. It is kept on all day, and only taken off at night on going to bed, when it is washed in warm water and hung up to dry. The ulcer is then covered with some simple dressing, which is kept in contact by a few turns of an ordinary roller.

Since the publication, about fifteen years ago, of Dr. Martin's memoir, "On the India-Rubber Bandage for Ulcers and other Diseases of the Legs," this mode of treatment has come into very general use everywhere, and a whole volume could be published made up of clinical reports and articles that have appeared on this subject alone. Surgeons like Clutton, of St. Thomas's Hospital, are enthusiastic in their praises of this mode of obtaining a uniform curative pressure; it is, says Clutton, "the best method yet devised of applying an old therapeutic principle." It is, of course, understood that this treatment is adapted to simple rather than specific ulcers; a syphilitic sore will demand the specific treatment in addition to the local.

But there are chronic ulcers which cannot be made to heal by any amount of strapping or bandaging; here multiple incisions have been recommended, as by Dr. F. Spaeth, in the *Practitioner*, May, 1888. This writer affirms that the lateral incisions and the circular incisions around the margin, recommended by Weber and Nussbaum, have generally proved unsuccessful. (This has also been the experience of Billroth, Verneuil, Nélaton, and others.) His method is more radical still. The entire ulcer is divided lengthwise by a deep incision, extending far into the healthy tissue. Cross incisions are then made through the callous tissue into the healthy at intervals of about three-quarters of an inch. The incisions must go through not only the skin, but the underlying fascia; the wounds must gape widely. The bleeding, often profuse, must be stopped with tampons; and the whole wound is then done up with iodoform dressings. "When, after eight to fourteen days," says Dr. Spaeth, "the dressing is changed, the difference in appearance is very marked. Healthy granulations are springing up in abundance from the gaping incisions, and soon cover the whole surface, reaching the level of the surrounding skin, from which the growth of new epidermis is seen to advance rapidly. . . . The advantage of this method is that highly vascular healthy parts are enlisted in the healing process of granulation, and thus not only the wound but the resulting cicatrix are under more favorable conditions. It might be expected, and facts confirm the expectation, that this cicatrix is far stronger and more resistant than the thin covering which may occasionally be obtained from scanty granulations, after the use, perhaps, of every means in the surgeon's armamentarium, and with great difficulty that."

* *Medical News*, October 15, 1887.

We have only space to mention without comment an ingenious device of Dr. Philip Cowan, which he calls "A New Method of treating Ulcers," and which is based on the fact that an ulcer is "a local asthenia of the skin and parts beneath," "a local tendency to degeneration and death." Availing himself of the property of absorption inherent in ulcerated surfaces, he would *feed the ulcer* with such nutrient substances as eggs and milk and flour, applied in the form of a paste to the part. He claims that his theoretical provisions have been proved to be scientifically well established by the results of practice, and gives reports of eighteen cases where the ulcers were "fed" till cured.*

Skin-grafting was introduced in 1869 by Reverdin, of Paris. It has proved to be a most valuable means of cure in many cases. The grafts are generally taken from the anterior aspect of the forearm, and include only the cuticle, with the rete mucosum and the apices of the papillæ. The grafts are placed about half an inch apart, and are confined by pieces of gutta-percha tissue and strips of plaster. With due care, it is quite easy to get a number to take, and thus there are provided "new centres of cutification," which also have the power of exciting cicatrization at the margin. Brilliant results have been obtained by this mode of treatment, which ought always to be tried in bad, intractable cases.

The constitutional treatment of indolent ulcers must be adapted to the cachexia accompanying or producing them. Some patients need only a general tonic and reconstituent treatment; others are gouty, tuberculous, or syphilitic, and demand the proper remedies for those dyscrasiæ. He will have the best success in treating chronic ulcers who best masters the various etiological factors concerned in their production.

THE GALACTAGOGUE PROPERTIES OF GALEGA.

IN our last issue we published a note as to the claim which has recently been advanced concerning the galactagogue properties of galega, and have since then received several inquiries from correspondents for more particular details as to the character of this drug and its mode of action.

The *Galega officinalis* is a leguminose plant, indigenous to Italy and the southern part of France, and has been known since the earliest times. In Guersant's "Dictionnaire des Sciences Médicales," published in 1816, it is stated that, as long ago as 1576, it was employed as a sudorific in the epidemic of pest, which was then ravaging Lombardy, but apparently without any satisfactory effects; and, in fact, the statement is there made that this plant possesses no properties which merit its attracting the attention of the physician, and that it might without loss be discarded from the materia medica. Ten years later Bèclard, Chomel, Cloquet, and Orfila published their "Dictionnaire," and likewise gave no better reputation to galega, for they stated that, although it possessed slight aromatic properties, and had been recommended as a sudorific in malignant fevers and epilepsy, there was not sufficient evidence as to its therapeutic value.

In 1873 a memoir was presented to the Académie des Sciences by Gillet-Damitte, calling attention to the value of this plant as a forage, this claim being based, in the first place, upon chemical analysis of the dry galega, published by Gaucheron, in which it was stated that this plant closely agreed in composition, both in the nature and in the proportion of its constituents, with that of the best cow's milk. Experiments were also alluded to in which it is stated that cows fed solely on this forage within twenty-four hours formed from thirty-five to fifty per cent. more milk than before this feeding was commenced. At the same session of the Académie des Sciences, Dr. Bourgeois presented a certain number of observations, which he had made and which, he maintained, pointed towards the efficiency of the syrup of galega as a galactagogue, and as to the advantage of using this plant as a fodder.

Since then numerous observations have been published by Cerisoli, Goubeaux, and Masson d'Audry, all of whom attributed more or less degree of activity to this plant in this connection, while in the *New York Medical Journal* for 1889, Dr. Millbank called attention to a proprietary remedy known as "nutrolactis," which was endowed with energetic galactagogue properties, and which was found to consist principally of an alcoholic extract of galega.

In the paper already referred to, read by Dr. Carron de la Carrière at the Société de Médecine Pratique, January 15, 1891, four cases are reported in detail, in which the properties of this substance were tested

* "Braithwaite's Retrospect," Part lxvii. p. 167.

(*Journal de Médecine de Paris*, February 15 and 22, 1891). Without going into the details of these cases, their results seem to show that the administration of watery extract of galega, prepared from the fresh plant, possesses the power of increasing both the quantity and the quality of the milk, while at the same time improving the general nutrition. The watery extract of the fresh plant is almost black in color, with pronounced odor, and is soluble in water, but incompletely soluble in alcohol. It may be associated with syrup, or may be administered in wine, or it may be given in the pill form. An infusion of 50 parts of the leaves to 1000 parts of boiling water has a greenish-yellow color, an aromatic odor, and is soluble in water, while it is not disagreeable to the taste. Dr. Carrière, however, prefers the watery extract, which he prescribes in doses of 15 to 75 grains daily, given in divided doses of 7½ to 15 grains.

It would be interesting to see whether other physicians confirm the claims advanced by Dr. Carrière.

ON THE ACTION OF SALTS OF CANTHARIDINIC ACID ON TUBERCULOSIS.

SINCE our last issue went to press, Professor Liebreich, so well known as the discoverer of chloral, and as a careful and reliable investigator, has, in a paper read before the Berlin Medical Society, held February 25, 1891, supported the claim as to the value of a compound of cantharidinate of potassium in the treatment of tuberculosis, especially when located in the larynx, his results being published in current numbers of the *Berliner Klinische Wochenschrift*.

As is well known, cantharidin was employed by the ancients, and we find mention of its use in the works of Hippocrates and Pliny, but little by little it has passed into oblivion on account of the accidents which its internal employment may produce; nevertheless, merely a cursory glance at medical literature will reveal reports published by numerous of the physicians of old times, especially in France, who claim marked curative properties for cantharidin.

Cazenave has mentioned that psoriasis may be cured by tincture of cantharidin, in the daily dose of 20 drops, while Hufeland recommended it in pulmonary affections, where it is claimed to have produced good results. Tincture of cantharides, however, has the great disadvantage of not possessing a constant composition, for the insects which serve for its preparation do not always contain the same proportion of active substance, the differences varying from three to six per cent., so that, to be sure of the action of cantharides, it is now generally admitted that the active substance, isolated by Robiquet and known under the name of cantharidin, should be employed. In addition to its well known special action on the genito-urinary apparatus, the researches of Cornil have proved that cantharidin causes the formation of cellular exudations. Aufrecht has found that, in submitting animals to repeated injections of cantharidin in doses almost poisonous, that nephritis is produced, with a small contracted kidney. Hansemann has, however, shown that, injected into a rabbit, a dose of cantharidin sufficient to kill the animal, produces a non-coagulable exudation in the capsules of Bowmann, which is free from cellular elements, while death is produced by paralysis of respiration.

At the autopsy, no œdema of the lungs can be recognized. These facts seem to show that, taken in a fatal dose, cantharidin does not produce such inflammatory action as is exerted on the skin, but that it gives rise to a pathological process in the capillaries, which causes a serous transudation; the production of this transudation is, therefore, the characteristic action, and exists in the capillaries of the lungs as well as in the capsules of the kidneys; but in the lung the transudation is less marked than in the kidneys, and one might imagine that if the lung possessed capillaries on the same plan as those of the kidney, and the kidney those of the lung, that cantharidin would prevent respiration but leave the kidney intact. Again, it might be supposed that capillaries which were irritated or inflamed would react to cantharidin more vigorously than healthy capillaries, and it might thus be possible to give doses of cantharidin which would be without action on healthy capillaries, but which would produce a transudation of serum around diseased capillaries. It is evident that this transudation would not be without influence on the nutritive processes in localities in which it took place, for serum might serve to reanimate the almost extinct activity of the cells, and, it being admitted that the serum of the blood possesses bactericidal properties (it is certainly true in the serum of a dog or of man), it is evident that if one could produce a transudation of serum at

the seat of pathological processes, marked therapeutic effects might be produced. After having convinced himself that cantharidin, in the form of cantharidinate of potassium, in small doses was not dangerous, this substance was then tested on several patients in the Augusta Hospital under the care of Dr. Ewald and Dr. Gunlich, while later experiments were made by Professor Hahn, Dr. Bode, and others. The first injections were made with a dose of $\frac{1}{320}$ grain, the quantity being gradually increased until it was found that about $\frac{1}{120}$ grain constituted the maximum dose.

Professor Liebreich stated that, although he did not wish to lay stress upon the benefit observed in cases of tubercular laryngitis, he had, nevertheless, seen marked improvement follow after the second injection, and that in no case, provided the kidneys were healthy, was there any untoward effect.

Professor Leibreich calls attention to the fact that the salts of cantharidinic acid now on the market are not sufficiently constant in their composition to be relied upon, and that to obtain a perfectly constant solution it is necessary to dissolve with prolonged heat absolutely definite amounts of cantharidin and alkali, and then to dilute carefully with water until the desired concentration is obtained. Professor Liebreich's experiments have shown him that the theoretical amount of alkali necessary to neutralize cantharidinic acid is insufficient, and that, if the hydrate of potassium is used, a double amount must be employed to produce permanent solutions. His formula, therefore, as published in the *Therapeutische Monatshefte* for March, 1891, is to weigh out 3 grains of pure cantharidin, 6 grains of potassium hydrate, dissolving in 320 minims of water (20 c.c.), heating the solution for a long time in a water-bath, and then add enough water to make a litre. If caustic soda is desired, 2 parts of cantharidin must be heated with 3 parts of caustic soda in the same manner, and dissolved in the same amount of water.

At the meeting at which this communication was read reports were presented by Drs. Paul Heymann, G. Guttmann, and B. Fraenkel, as to the results which they had obtained in the use of the cantharidinate of potassium in cases of tuberculosis (*Berliner Klin. Woch.*, March 2, 1891).

Dr. Heymann had used the cantharidinate of potassium in twenty-seven cases. Of these, however, only seventeen could be recorded as satisfactory. All of the cases were suffering more or less from serious tubercular affections of the larynx, while in all the lungs were also affected, and tubercular bacilli were recognized in the sputa. All were treated as outpatients, and no change was made in their ordinary mode of life. The dose injected varied from $\frac{1}{600}$ to $\frac{1}{150}$ grain. In a few instances headache and giddiness were complained of after the injections; occasionally there was slight diarrhœa. In some cases slight scalding was noticed on micturition, and one patient said he noticed blood once in his urine after the injection of $\frac{1}{200}$ grain. In all the cases where this remedy was tested other treatment was suspended, and in the majority of cases the claim is made that, after three or four injections, the voice improved steadily, until hoarseness almost entirely disappeared. The patients felt much better, the physical signs in the chest improved, expectoration became smaller in quantity, more mucous and less frequent, cough subsided, night-sweats diminished, and in one case headache and fever disappeared after the fourth injection. In tuberculous diseases of the tongue, after the use of this remedy, the granulations became flatter and paler, the ulcers became cleaner and began to heal, while in one case a patient who had almost entirely lost his voice, and who was a subject of tuberculous ulceration of the larynx, the ulcer entirely healed after nine injections, and after three more the only abnormity in the larynx was a scarcely visible infiltration of the vocal cords, while the physical signs in the chest had entirely disappeared. In no case, however, did he observe that the remedy produced any influence on the form or on the number of the bacilli.

At the same meeting, Dr. Guttmann spoke favorably of the use of this remedy, relating the case of a patient whom he had been treating for typical trachoma and recent granulation in the left eye. Laryngitis developing in this case, he was subjected to Liebreich's method of treatment, with entire relief, both of inflammation of the eye and of laryngitis.

Professor Fraenkel also stated at this meeting that he had commenced on February 7 to experiment with the cantharidinate of potassium, and had treated in all fifteen cases of laryngeal phthisis with it; five of these were presented to the Society. Under the influence of this treatment he stated that redness and suppuration of the cords steadily diminished, pain and swelling also disappeared, while the ulcers gradually became smaller, and, in some instances, healed en-

tirely. Aphonia, which had been present before, in most cases disappeared. He also stated that he was able to confirm Liebreich's views as to the action of this remedy, for in one case he had actually seen a serous exudation develop in the larynx, and when this patient coughed he brought up serous liquid. Professor Fraenkel thinks he has been able to observe a direct influence on the bacilli, noting that they seem to diminish in frequency and to have lost their reaction to coloring-matter. No claim is made that any one of these cases is cured, but the improvement is stated to have been most brilliant.

The meeting of the Berlin Medical Society, held on March 4, was also mainly occupied with a discussion of the action of Liebreich's new remedy for tuberculosis, and the most striking feature developed is, in the first place, the extreme caution with which the statements are made; and, second, that the constitutional disturbance produced by this remedy is insignificant as compared with that which followed the use of Koch's remedy.

Dr. Saalfeld (*Lancet*, March 14, 1891) showed a case of lupus of the cheek, which had been greatly improved by this remedy. Dr. Liebreich declared that the remedy in repeated doses produces œdema of inflamed mucous membrane, while small doses cause increased expectoration, and that the signs of œdema rapidly disappear; further, that the action of this remedy is to promote exudation of serum from blood-vessels. Dr. Lublinski had employed cantharidinic acid in sixteen cases, and alluded to the fact that there was some pain excited by the method, and he had seen headache, diarrhœa, strangury, and slight hæmoptysis follow it, although he had never exceeded $\frac{1}{320}$ grain a day. Several ulcers in the larynx rapidly healed, and a diminution took place in the size of lupus patches. Professor Fraenkel had also noted improvement both in the cough and in the physical signs in pulmonary phthisis, and in two cases a notable subsidence of the hectic fever. He had, however, met with strangury and albuminuria as a consequence of the treatment, which, in view of the renal troubles, he urged should be employed with the greatest caution. Professor Liebreich also emphasized a fact which is worthy of notice, and that is, that no rise of temperature is caused by the injections; he also repudiated the claim of cantharidinic acid being a specific, mentioning simply the power which it had of producing serous exudations in local inflammations, and stated that what he termed "serum therapeutics" might be found applicable to many other diseases than tuberculosis.

Reports on Therapeutic Progress.

KOCH'S TREATMENT OF CUTANEOUS TUBERCULOSIS IN PARIS.

In the latter part of November, 1890, there was constituted at the St. Louis Hospital in Paris a committee composed of Drs. Vidal, Besnier, Fournier, Hallopeau, Quinquand, and Lailler, deputed to study and report on the effects of Koch's lymph on the cutaneous forms of tuberculosis, more especially lupus. In the *Lancet* for February 28, 1891, the Paris correspondent of that journal gives the following account of the results obtained by this committee:

A male and a female ward were set apart for the purpose, and a special staff of students detailed for taking and registering clinical observations. All the patients, numbering fifty, were first carefully examined *seriatim* by the assembled committee, and, the diagnosis verified, the programme of inoculations for each case (date of repetition and dose) was made out, subject to modification. Each patient was, moreover, kept under observation for several weeks after the termination of the treatment (the end of January). All necessary antiseptic precautions were taken, and the whole inquiry rendered as precise as possible. On the 13th inst. MM. Besnier and Hallopeau presented in their turn to the Société de Dermatologie et de Syphiligraphie a very full report of the proceedings of the committee, illustrating it by a table, giving the following heads of information: Age and sex of patient; diagnosis; number and date of inoculations, with doses; principal phenomena of the inoculatory fever; characters of the local reaction; date when tolerance was established; other phenomena and complications observed; result of the treatment; name of the physician treating the case. The table contains the history of thirty-eight cases, the remaining twelve not being included because certain of them were cases of leprosy, while in the rest the treatment had either been interrupted or had been undertaken too recently to merit a place in the list. After a few introductory remarks, M. Besnier said: "There is one feature attending the application of the method which the appended table

cannot bring home to your minds. No mere reading will enable you to adequately appreciate its importance, and I am surprised that, in so many published accounts of the inoculations, this aspect of the question is glossed over with such a light heart. I refer to the suffering inflicted on many of the patients experimented upon. Whoever has visited our wards six or eight hours after a series of inoculations of patients who had not yet reached the period of tolerance will never forget the spectacle." The above remark furnishes the key-note to the criticisms that follow. The speaker added that, although no fatal result had occurred in their practice, several of their patients had, despite precautions as to dosage, frequency of inoculation, etc., been in danger of falling victims to the action of the toxine. Two points dominate the history of these experiments,—viz., 1, *local reaction:* its insufficiency, its progressive diminution in spite of the increased dosage, and its ultimate cessation; 2, *general reaction:* its noxious effects in certain cases, the serious localization of its action on the viscera in general, and on the circulatory system in particular, and finally the risks of a fatal result even with feeble doses, and even after a single injection. The committee deny the germicidal properties of the liquid, as also its power of sterilizing the tissues invaded by the bacillus. When a patch of lupus is inoculated with the liquid, its local effects do not exceed those excited in healthy skin, cellular tissue, or muscle into which it is injected. Nay, there is reason to believe that, thus employed, it tends to favor the tuberculous process. In a little boy affected with lupus of the lower extremities a patch was inoculated with the liquid, and that patch is now, several weeks after the operation, considerably more florid than its neighbors. The inoculations provoke local irritation of an exudative nature, with a tendency to consecutive cicatricial atrophy; but this tendency is followed by a revival of the tuberculous nodules, which appear to be endowed with greater vitality than ever. In the cases experimented on not only have all the nodules reappeared, but fresh ones have also sprung up. As to the alleged affinity of the liquid for tuberculous tissues, the committee need only call to mind the following phenomena noted before, coincidently with, or independently of, the irritation of the lupus parch,—viz., hyperpyrexia, leucocytosis, diminution of red blood-corpuscles, cutaneous eruptions, endocarditis, pulmonary, splenic, and renal congestion, hæmaturia, albuminuria, arthropathies, and many another neurodynia affecting viscera certainly free from tuberculosis, or which are simply in a state of physiological congestion,—*e.g.*, the ovaries in menstruating women. The ephemeral fever of Koch generally reveals itself locally in cicatricial or "closed" lupus by the provocation of inflammation of an erythematous, erythemato-squamous, or erysipelatous type, bearing a great resemblance to the recurrent attacks of lympho-dermatitis so common in cutaneous tuberculosis. In "open" lupus the reaction is more manifest, being characterized by a serous discharge, œdema, and the formation of scabs,—a rare occurrence in "closed" lupus. In all forms of lupus the local reaction may be intense, but at St. Louis it has never been seen of such violence as to cause loss of substance. In every case the reaction is only a passing storm, which subsides in a few days, excepting when the operation has excited phlegmonous inflammation in glands, or in the neighborhood of joints. The storm over, a more or less marked reduction in volume is noted in the pathological mass, together with a diminution of vascularity of the adjacent tissues, followed by a certain levelling of the surfaces affected. Sometimes there is also noted an obvious tendency to cicatrization, which appears extraordinary only to observers imperfectly acquainted with the normal lupic process. This curative effort is sometimes very remarkable; but even when it is very marked the tubercle is never destroyed. A striking case was cited in support of this statement. This partial or general reduction in volume is not always proportionate to the intensity of the apparent reaction. It is observed more particularly in the upper lip or other parts where the lesion is complicated by the chronic lymph œdema which is so pronounced a feature in certain cases of lupus. Should this constrictive process occur in lupus of a cavity, such as the nose, much relief is experienced from the restoration of the patency of the passage. In buccal, pharyngeal, and laryngeal tuberculosis the same relief may be conferred. But even after reiterated inoculations the previous condition is not only re-established, but it becomes sometimes aggravated. Of the lupic patients who have been benefited the most from the treatment, not one has been cured, the improvement having been only temporary. In not one of the cases of lupus of the parts situated behind the nostrils has

cicatrization of the ulcers been obtained. In the majority of the cases tolerance has been established, and the experiments have thus necessarily been brought to a premature conclusion. Even should the susceptibility to the action of the liquid reappear at a future time, no advantage will have been gained, for fresh tubercles will have developed in the mean time. It is a case of "No thoroughfare!" Several writers have compared the action of Koch's liquid to that of the (now rare) intercurrent attacks of erysipelas sometimes seen. But even in its most intense form the local reaction excited by tuberculin never attains the proportions, nor does it present the same characteristics of form and duration, of true erysipelas. A single attack of this latter disease effects a cure apparently more complete than has been noted in any one of the fifty patients of the committee. It should be remembered, however, that even erysipelas never cures lupus. In none of the patients of the committee has there been obtained a result superior, or even equal, to that realized in the same time by ordinary methods of treatment. Painful as these latter are, they occasion less suffering than is entailed by the fever consecutive to inoculation. M. Besnier thus sums up: "1. In cutaneous tuberculosis in general, and more particularly in all the divers forms of lupus, the inoculation of Koch's liquid is productive of a local reaction, the earliest effect of which is the temporary reduction of the morbid mass. Very appreciable in all the 'open' varieties of the lupus of Willan, this atrophic process becomes less marked in the 'closed' varieties, and is still less in the dry, sclerotic, fibrous forms. The minimum result is seen in the lupus of Cazenove, all the varieties of which are dry and 'closed.' In all these forms the beneficial effect may be considerably increased by the simultaneous employment of any therapeutical measures which excite deep irritation of the lupus, or which convert it into the 'open' variety. In the immense majority of cases the treatment, even when pushed to tolerance, is incapable of curing; it is not superior, indeed it is not equal, to methods of treatment in actual use. 2. In every case, without exception, however feeble the dose injected, the local reaction cannot be evoked without the ephemeral fever, the intensity of which cannot be predicted, but which, even with small doses, and with a single inoculation, may kill the patient. Even when the patient does not succumb, the toxine may occasion grave persistent symptoms in relation more particularly with the circulatory system, the brain, or the kidneys, not to mention the awakening into renewed activity of tuberculous deposits which had hitherto lain dormant. 3. Such being the case, I do not consider myself, nor do I deem any other physician, authorized to continue these experiments with Koch's liquid. In refusing to persevere with the application of the method, I believe I am only acting in conformity with the dictates of humanity, and with that respect for human life which is one of the noblest characteristics of French medicine." M. Hallopeau continued in the same strain, and gave it as his opinion that, the therapeutical value of the liquid being at best extremely limited, its employment is for the present contraindicated.

THE TREATMENT OF PNEUMONIA BY LARGE DOSES OF DIGITALIS.

We have on one or two previous occasions called attention to the mode of treatment recommended by Dr. Petresco of combating pneumonia with large doses of digitalis, and in the *Therapeutische Monatshefte* for February, 1891, this author publishes an additional communication on this subject, in which he offers a number of arguments and reports of a number of cases to support his position as to the value of very large doses of digitalis in this disease. The dose which this author recommends is simply enormous in contrast to that which is ordinarily regarded as the safe dose of digitalis, Professor Petresco stating that he does not hesitate in single doses to give as much as 180 grains of digitalis-leaves in twenty-four hours, although he admits that ordinarily the dose for twenty-four hours does not exceed 25 grains. He prefers the infusion made with 4 parts of digitalis-leaves in 200 of water, and then adding 40 parts of syrup of orange-peel, the dose then being a tablespoonful every half-hour. He states that in general this dose is very well borne, and that he has never met with a single case of poisoning. Dr. Petresco meets the incredulity which has been expressed as to the tolerance of these large doses, with the explanation that he can only have employed inferior quality of digitalis-leaves, with a denial, and states that he has employed the leaves obtained from all the best pharmacists in Europe, with, as a rule, the same results. He states that he has obtained the best results in genuine fibrous or croupous pneumonia. In infectious pneu-

monia he has usually combined it with antiseptic methods. He also states that he has obtained satisfactory results in cases of pneumonia complicated with bronchitis and pleurisy, and he claims in the most positive manner to have cut short undoubted cases of croupous pneumonia, so that within twenty-four to forty-eight hours—the time necessary for the effects of the digitalis to be demonstrated—he has succeeded in obtaining sudden and almost absolute reduction of the temperature to the normal, accompanied with reduction of the pulse, while at the same time this disappearance of fever is accompanied by general improvement in the patient's condition, pain and cough being diminished, the temperature becoming normal, while the healing process rapidly goes on to completion. These large doses, with the exception of but rare cases, are without effect on the digestive canal, although sometimes he has met with vomiting as the result of this method of treatment. The most evident symptom detectable as to the effect of this medication is the marked slowing in the pulse, with increased tension. The author publishes a number of sphygmograms, illustrating the effect of digitalis on the pulse in cases of pneumonia, and concludes his paper with the following deductions:

1. Digitalis has an important antiphlogistic action only in its special therapeutic dose.

2. Its specific therapeutic dose of digitalis amounts to from 75 to 150 grains of digitalis-leaves administered as an infusion in twenty-four hours.

3. This dose may be administered in from two to four days continuously, according to the severity of the case. In some cases from 300 to 375 grains of digitalis leaves being given in four or five days without symptoms of nausea, or in fact, any toxic effect. Treated with this dose, the temperature in cases of pneumonia falls from 1° to 3° C. after a single dose, and from 5° to 6° C. after three doses, while the pulse is slowed from 40 to 60 beats in the minute after six doses. This reduction in the pulse-frequency and in the temperature lasts from ten to twelve days, by which time the normal condition has been gradually obtained.

4. Simultaneously with this diminution in the rate of circulation and respiration, disappearance of all the local symptoms of pneumonia can be noted.

5. The value of this method of treatment is proved by statistics, the mortality of cases of pneumonia so treated with high doses of digitalis being much less than that observable when any other method is employed.

6. The value and harmlessness of this therapeutic dose of digitalis is established by the author's numerous individual experiments and by the cases reported by his scholars.

7. From studies as to the value of this method of treatment the author concludes that the expectant method of treating pneumonia is not only irrational but even dangerous; that the assumption that there is a definite cycle of progress in pneumonia is not warranted; that pneumonia may be cut short by an energetic rational mode of treatment, especially if the method is inaugurated at the onset of the disease, and that, finally, the claim is supported that the treatment of pneumonia with large doses of digitalis furnishes better results than that obtainable by any other mode of procedure.

ANTIPYRIN AND MERCURIC CHLORIDE.

The behavior of antipyrin in the presence of mercuric chloride forms the subject of a communication by MR. PETSCHE (*Pharm. Rund.*, February, p. 34). He states that upon mixing cold aqueous solutions of antipyrin and mercuric chloride, a white precipitate is formed. This disappears upon heating the liquid to boiling, but after keeping it at that temperature for a time a brown resin-like substance is deposited, which, when separated, dissolves in nitric acid, and is colored scarlet by sulphuric acid. This resinoid substance dissolves in boiling alcohol, and is partially deposited again from the liquid on cooling. The insoluble portion when dried yields a reddish-yellow powder, acid in reaction and bitter in taste. When heated on platinum-foil it melts and takes a scarlet color before charring. It dissolves in nitric acid, and the yellow solution becomes scarlet when sulphuric acid is added, but upon being heated turns yellow again, and eventually evaporates with a white fume, leaving no residue. With hydrochloric acid it gives a yellow solution that becomes red upon being heated, and leaves a yellow residue upon evaporation. A solution in hot alcohol gives a white precipitate with ammonia water, but not with water acidulated with hydrochloric acid. The portion of the original resinoid substance soluble in cold alcohol is obtained upon evaporation as a white, readily-powdered resin, acid in reaction, and very bitter, and giving color-reactions very similar to

those of the insoluble resin. It differs, however, in dilute hydrochloric acid throwing down a white precipitate from an alcoholic solution —*Pharmaceutical Journal and Transactions*, February 28, 1891.

THE INFLUENCE OF EXTRACT OF VALERIAN ON THE DESTRUCTION OF GLUCOSE IN THE BLOOD.

At a recent meeting of the French Académie des Sciences, Dr. Butte announced the results of some experiments which he had made as to the action of certain remedies, and especially the extract of valerian, on the destruction of glucose in the blood, his results being embraced in the following conclusions (*La Tribune Médicale*, February 26, 1891):

1. The addition of sodium bicarbonate and morphine to blood freshly shed delays the destruction of glucose.

2. On the contrary, curare accelerates this destruction.

3. The addition of extract of valerian has the effect of producing a marked diminution in the power which the blood possesses of destroying glucose.

4. Normal blood rapidly causes the disappearance of a large quantity of glucose added to it.

5. Extract of valerian injected into the blood-vessels acts in the same way as in experiments made outside the body,—that is, it slows the destruction of glucose contained in the blood.

THERAPEUTIC ACTION OF NITROGEN MONOXIDE.

Influenced by the statement that nitrous oxide has produced satisfactory results when inhaled for the relief of depressing emotions in hypochondriacal and neurasthenic subjects, Dr. W. R. Birdsall has undertaken a series of experiments to determine its therapeutic value, not as an anæsthetic for surgical purposes, its use for this purpose being well known, but for the relief of disease, when given by slow and prolonged inhalation short of the production of unconsciousness, and his results are embodied in a paper read before the New York Neurological Society on January 6, 1891 (*New York Medical Journal*, March 7, 1891).

It is exceedingly difficult to determine the therapeutic value of any agent or substance used as a remedy, and it is particularly difficult to determine whether any improvement which follows the administration of an agent should be attributed to it or to other causes. When the morbid process is chronic, varying factors which modify it can rarely be discriminated with accuracy. Observing the effect of a therapeutic agent on the general course of a given disease, is, as a rule, an uncertain method, and we can usually arrive at more positive data by noting the effect it produces on separate normal functions and their abnormal manifestations. Dr. Birdsall's studies, therefore, were at first confined to the testing of the nitrogen monoxide in relieving certain symptoms of morbid states, such as pain, spasm, and some morbid mental states. Two cases of migraine and one of persistent headache were treated by a number of repeated inhalations of the gas with no decided relief noted. In the case of paralysis agitans, no effect was noted on tremor or pulse-rate. In the case of asthma with chronic bronchitis, no diminution of the spasmodic asthmatic respiration was observed during inhalation, nor was any change noted on auscultation.

In two cases of insomnia, one with slight melancholia with chronic cardiac disease, no appreciable effect was obtainable, and, in fact, a negative result is stated to have followed its employment in cases of opium habit, two cases of hypochondriasis, one of neurasthenia, one of chronic bronchitis, and one of hysteria. The chief cause of the failure, according to the opinion of Dr. Birdsall, is the transient effect of the gas due to its rapid elimination. During its administration, if we leave too long an interval between the inhalations, the most intense effects will become so reduced that a considerable quantity of gas must be again taken to bring up the effects to the former degree, while slow but continuous inhalation will hold the effects with a very small amount of gas. The extensive series of experiments published by the Odontological Society of Great Britain show that the average time required for the production of anæsthesia is eighty-one seconds, and the time from the beginning of anæsthesia to recovery of consciousness but one hundred and fifteen seconds, showing the rapidity with which the gas is eliminated.

Dr. Birdsall reviews the various theories as to the physiological action of nitrogen monoxide supported by different observers, and concludes from his own experiments and the examination of this literature that the effects of nitrogen monoxide are attributable to the interference by displacement of the normal sup-

ply of oxygen to the tissues, and as the cortical functions are the most rapidly disturbed by imperfect oxygenation the cerebral disturbance is the most striking effect which follows administration.

Finally, Dr. Birdsall's opinion is that the uses of nitrogen monoxide are restricted to its effect as an anæsthetic and as a placebo.

In the discussion which followed, this opinion was coincided in by Drs. R. L. Parsons, W. M. Leszynsky, W. J. Morton, and C. L. Dana.

THE GERMICIDAL PROPERTIES OF BLOOD.

A great deal of important information has lately been obtained on this subject, and Von Fodor, who has already contributed some useful papers, publishes in the *Centralblatt für Bakteriologie und Parasitenkunde*, vii. No. 24, some further experiments which he has made, especially directed to ascertain under what conditions the germicidal properties of the blood are at their highest, and in what way the composition of the blood affected these properties. The first series of researches had reference to the composition of the blood, and proved, in the first place, that arterial blood has a more destructive action on the bacteria than venous, and also that fresh blood has a more powerful action than that which has been shed for some time. Again, the germicidal power of the blood was weakened in an atmosphere consisting entirely of oxygen or carbolic acid ; on the other hand, the removal of gases from the blood had no appreciable influence. The blood of rabbits which had been poisoned by carbolic acid gas was not fatal to the bacteria. As regards the influence of the movement of the blood (circulation), experiments were made by placing the blood of rabbits, which had already been inoculated, in small globes, some of which were kept in constant movement and others quite stationary. No appreciable difference was observed. Some very interesting results were obtained in reference to the temperature of the blood. From these it would seem that the germicidal power of the blood increased with the rise of temperature, reaching its maximum at 38° to 40° C., and then again gradually diminishing. The author mentions an interesting fact,—*i.e.*, that the individual predisposition of any animal to an infectious disease seemed to stand in direct relationship with the germicidal power of its blood. The second series of researches was directed to the influence of drugs on the power of the blood to destroy germs. Hydrochloric acid had no effect. After treatment by tartaric acid a marked decrease was noticed, and the same result was produced by quinine. Common salt and carbonate of ammonium caused a slight increase of the power, the phosphate of sodium a more marked effect, while the carbonates of sodium and potassium produced a very remarkable increase. From the experiments the author concluded that any drugs which cause increased alkalinity of the blood considerably raised the resisting power of the organism against the inroad of bacteria. The third of this series of experiments corroborated this supposition. Of eight rabbits inoculated with anthrax, all died, while of nineteen which had been previously injected with soda solution, only three died, thus proving the efficacy of the alkalization of the organism. Of the remaining sixteen cases, a few were affected at a later date, but the majority remained perfectly free from disease.—*Lancet*, February 28, 1891.

THE RÔLE OF THE LIVER IN THE PRODUCTION OF UREA.

Until the time of Prevost and Dumas, it was believed that urea was formed in the kidney. These physiologists proved by their experiment of removing the kidneys in animals that urea is performed in the blood or in the tissues, and from that day the kidney has been regarded rather as a filter than as a secreting organ destined to elaborate substances not previously existing in the blood.

Subsequently the doctrine was promulgated that urea is formed everywhere in the economy where nitrogenous waste is going on, its sources being metabolism of tissues and of unassimilated food proteids. The muscles were believed to constitute no inconsiderable source ; Wurtz's observation, that lymph contains more urea than blood, is suggestive of a direct relationship between urea and tissue metamorphosis.

The facts which have given rise to the belief that the liver is the principal, if not the only, producer of urea may be briefly stated as follows :

It was discovered as early as 1846 that the urine of persons affected with chronic hepatitis contains little or no urea ; twenty years later, Meissner, basing himself on accurate analyses of the urine in acute yellow atrophy of the liver, laid down the law that destructive diseases of the liver entail diminution or

suppression of urea. Bouchardat, in 1867, proclaimed that certain lesions of the liver are attended with augmentation of urea production, while others cause diminution. Brouardel and Murchison enriched medical literature by new observations, showing "that the quantity of urea secreted and eliminated in twenty-four hours is dependent on two principal influences: the state of integrity or alteration of the hepatic cells, and the greater or less activity of the hepatic circulation.

In those cases which are characterized by augmentation of urea, the liver has not been found to be the seat of grave organic lesions, but only of simple functional disturbances, a hyperæmia, it may be, similar to what is observed in a certain number of cases of diabetes. In one case of spasmodic icterus, Bouchardat noted the enormous quantity of one hundred and thirty-three grammes of urea in the twenty-four hours, and the excretion continued in this proportion for three or four days. Fourcroy and Vauquelin also announced about the same time (1846) that in icterus the urine may contain a very large proportion of urea. Fouilhoux subsequently reported a case of simple hepatitis in which the figure of urea was double the ordinary.

Facts of the second group—where there is diminution of urea—belong to cases of destructive lesions of the liver, where the whole extent of the hepatic parenchyma is affected. Under this head we find acute yellow atrophy of the liver, common cirrhosis, cancer of the liver which has invaded large portions of that gland, hydatid cysts, abscesses of considerable dimensions, granulo-fatty degenerations of the liver, whether following grave infectious fever, or induced experimentally in animals.

Meissner's treatise contains the principal observations which have been made on animals confirmative of the pathological observations above mentioned. According to this authority, urea is not found in the muscles or in the lungs of mammals, but almost exclusively in the liver. In the liver of a dog which was bled to death several centigrammes were obtained; the organ was carefully washed and the vessels flushed out with warm water before being subjected to analysis. The results obtained by Meissner have been confirmed by Cyon, who concludes "that there is a real and rapid production of urea in the passage of the blood through the liver." Cyon appeals to facts similar to those adduced by Claude Bernard to prove that the liver produces sugar: the blood of the hepatic vein is found to contain more urea than the blood of the vena portæ.

Lecorché and Talamon do not dispute the proposition that the liver produces urea, or that there is more urea in the hepatic than in the portal vein; they do dispute that the liver is the sole or the principal urea-forming organ. To the statement that in destructive diseases of the liver there is a diminution of urea, they oppose careful observations of their own, where, despite such destroying lesions (diffuse cancer, diffuse venous cirrhosis), the quantity of urea remained normal. This fall in the proportion of urea, of which Murchison and Brouardel make so much in its application to serious hepatic lesions, is equally characteristic of every disease of long duration, of every cachexia, cancerous, tuberculous, or otherwise; it is, however, true, as a general rule, that in affections which alter the structure of the liver, the fall in urea-production is a little greater than in the chronic diseases of other organs. This is easily explained on the ground that the liver is an organ of great magnitude and importance; "it is quite natural that the quantity fabricated should fall considerably when a centre of formation so important is suppressed, but it will not do to push too far the consequences of this fact, and make ureopoiesis —that is, *urea-making* (from the Greek)—a special function of the liver." In fine, the diminution of urea and the appearance of leucine and tyrosine and extractives in the urine are not accidents proper to acute yellow atrophy or other wasting diseases of the liver, "but simply an episode of the general perturbation imposed on the phenomena of disassimilation of the entire organism by the infectious disease."

Lecorché and Talamon next take up the facts adduced by Murchison and others, from which the conclusion is drawn that in states of hyperæmia, or excitation of the liver, the production of the urea is exaggerated. This they admit to be true, but "polyuria, with augmentation of urea, is not peculiar to hepatic affections, being only a critical phenomenon, such as may be observed in any other acute disease; lastly, if physiology seems to have demonstrated that urea is formed in the liver, clinical observation does not permit us to believe in a special function of that gland, but only in a phenomenon of disassimilation, such as takes place likewise in the intimate substance of all the tissues of the organism."

This, then, which is really the older doc-

trine, may, we think, be regarded as the latest authoritative teaching of science respecting the puzzling question of the sources of urea in the economy.—*Boston Medical and Surgical Journal*, February 26, 1891.

A SIMPLE TREATMENT FOR CORNEAL ULCERS.

According to the Paris correspondent of the *Lancet* for February 28, 1891, M. VALUDE, one of the ophthalmic surgeons of the Quinze-Vingts Eye Hospital, communicated to the Académie de Médecine on February 10 a new method of treating those troublesome cases,—ulcers of the cornea,—so simple in its application, and, according to its inventor, so successful in its results, that it cannot fail to be generally adopted. Hitherto corneal ulcers complicated with hypopyum have been treated by puncture either by the knife or thermocautery, this operation having frequently to be repeated, and too often leaving behind it opacities, if not actual staphyloma. For this unsatisfactory method M. Valude substitutes a simple dressing, consisting of a pad of salol gauze, which, with a moistened gauze bandage, effectually seals the eye and maintains a certain amount of compression. Before being applied, the eye is carefully disinfected. The dressing is not renewed until after three or four days have elapsed, when the ulcer is found to be already healing, and the collection of pus in the anterior chamber much diminished. M. Valude states that the cornea tends to regain its original transparency without any opacities. In corneal ulcers uncomplicated by hypopyum, M. Valude, relying on his experience of fifteen successful cases, asserts that this new treatment is *the* treatment *par excellence*.

ACTION OF ANTIPYRETICS.

The action of antipyretics may be supposed to be due to the limitation of the oxidation processes and consequent lowering of heat development, or to an increase in the heat radiation from the surface of the body. Moreover, they may have a purely local action,—*i.e.*, on the cellular tissue,—or they may influence the nerve-centres, regulating the development or radiation of heat. MESSRS. SAWODOWSKY and PODANOWSKY consider that they have proved that the lowering of temperature produced by antipyrin and antifebrin is attributable exclusively to their influence upon the brain-centres regulating the temperature, which occurs in the corpus striatum (*Apot. Zeit.*, February 11, p. 87). The authors in an experiment cut the brain of an animal through close behind the corpus striatum and thalamus opticus, so as to isolate the organism from the heat-centres, while the connection with the respiration and vasomotor centres was retained. Although the animal so treated lived for some time, and the arterial blood-pressure and breathing remained unaltered, the body temperature fell continuously. Even injections of the most powerful pyretics, such as putrescent matter, caused not the slightest rise of temperature, although all the other symptoms of putrescent infection were present. Equally powerless were antipyrin and antifebrin to hinder in the slightest degree the fall of temperature. The skin temperature also remained entirely unchanged, although in the case of normal animals this rises considerably after the injection of antipyretics. An apparent exception was noticed in the case of quinine hydrobromide, but this was attributed to the known action of bromine. The conclusion drawn by the authors is that the action of quinine salts—resorcin and thallin—in lowering the temperature is dependent upon their specific influence upon the temperature regulating centres situated in the anterior part of the brain.—*Pharmaceutical Journal and Transactions*, February 28, 1891.

THE TREATMENT OF HYPERTROPHIC MUCOUS PATCHES BY APPLICATIONS OF TANNIN.

The difficulty which attends the treatment of certain hypertrophic forms of the secondary manifestations of syphilis, and especially hypertrophic mucous patches around the anus, is well known. Mucous patches in this locality frequently acquire considerable volume, aggravated by the secretions of the part, and again an entertrigo may arise, which frequently persists, in spite of the cure of similar accidents elsewhere through the influence of general or topical treatment, such, for example, as the nitrate of silver. Of the various agents which are frequently employed as topical applications in this state of affairs, tincture of iodine may be dismissed as being more painful than efficacious. Actual cautery, if the patient will submit to it, may give somewhat more satisfactory results, while mercurials, which are so valuable in most of the cutaneous manifestations of syphilis, are here inert, or, at the

best, extremely slow in their action. In the *Gazette Médicale de Paris* for February 28, 1891, DR. THIERY states that he has had most satisfactory experience with the employment of tannin in such conditions, and he reports three cases of hypertrophic mucous patches situated around the anus which were cured within twelve days by the application of tannin applied twice daily. Tannin, nevertheless, does not possess any specific action on secondary mucous syphilomata, for the author states that his results have been much less satisfactory in the treatment of buccal patches.

THE ANTIPYRETIC TREATMENT OF FEBRILE AFFECTIONS OF CHILDREN.

In the yearly report of the Children's Hospital of Berne, PROFESSOR DEMME publishes a number of rules as to the selection of antipyretic measures in the treatment of various febrile affections in children, and his results, which are exceptionally valuable, in that he has rich experience, are published in the *Wiener Medizinische Blätter* for January 1, 1891.

In the first place, Dr. Demme maintains that he is firmly convinced that, in children, febrile affections, with moderate fever, from 100° to 101° F., are best treated without any antipyretics whatever in the way of therapeutics, and that the febrile symptoms may be best controlled by cloths wet in cold water and wrapped around the trunk. His experience, he states, has taught him that such moderate febrile temperatures, with the accompanying nervous excitement and restlessness and the insomnia, or still more alarming profound somnolence, can be more satisfactorily overcome by baths of from five to ten minutes' duration each, administered twice daily, the temperature of the water being from 79° to 82½° F. When, however, the temperature reaches 104°, and remains at this elevation, then antipyretics are necessary, although the author shows that there is the greatest choice in the selection of a suitable remedy for this purpose. Regard must not only be paid to the elevation of temperature alone, but also the character of the morbid process and the condition of the patient's strength must come into consideration. His experience, he states, has taught him that typhoid fever, acute articular rheumatism, and broncho-pneumonia of asthenic type best respond to the antipyretic therapeutics. He rarely, however, employs them, or only exceptionally when compelled to, in diphtheria, in the acute exanthemata, such as scarlet fever and measles, and in simple croupous pneumonia. What was said above as to the employment of baths alone applies also to the combined employment of antipyretic drugs and baths. He only recommends the employment of baths when the temperature of the body is reduced during its administration in extremely rare cases and only when there is an alarmingly high temperature. In the large majority of cases, lukewarm baths, of the temperature above referred to, more or less prolonged in administration, will give much more satisfactory results. In cases where the soporific symptoms are especially marked, and where there is deep red or light cyanotic color in the face, lukewarm baths may be used, and are better taken at about 40° F., poured over the head and neck. As regards the selection of the individual antipyretics, in addition to the general observations already given in every case of acute articular rheumatism, when the condition of the digestive organs permit it, he uses the salicylate of sodium, or, where there is a tendency to vomiting or diarrhœa, or serious objection to the taste, he substitutes for it salol. Of the salicylate of sodium, the following are the doses to be administered in twenty-four hours: For children from 2 to 4 years of age, 7½ to 15 grains; for children from 5 to 10 years of age, 15 to 30 grains; for children from 11 to 15 years of age, 30 to 45 grains. The following are the doses recommended of salol: For children from 2 to 4 years of age, three times daily, a powder of 4 to 5 grains; for children from 5 to 10 years, three to four times daily, a powder of from 7½ to 12 grains; for children from 11 to 15 years of age, three to four times daily, a powder of 12 to 15 grains; and in typhoid fever he has found the greatest satisfaction upon the employment of thallin, administered in the form of a sulphate, giving it every two hours to children from 3 to 4 years of age in doses of ⅙ grain; from 5 to 10 years of age, in doses of ⅓ grain; 11 to 15 years of age, in doses of ½ to ⅞ grain. In cases of broncho-pneumonia, where the temperature may often reach 106°, antipyrin is the remedy which Dr. Demme recommends, giving it dissolved in large quantities of water, with the addition of a little sugar and a few drops of brandy. In this mode of administration he claims that disturbances of the appetite or vomiting will be entirely avoided. He states that this remedy has rarely failed to give him satisfactory results where he has attempted to produce marked reduction of temperature, notwith-

standing cases of broncho-pneumonia, or in the acute exanthemata, or even in malignant diphtheria, and he consequently prefers it to any one of the other antipyretics. He recommends the following doses, to be taken at hourly intervals: For children of from 2 to 4 years of age, 3 to 6 grains; from 5 to 10 years of age, 7 to 12 grains; 11 to 15 years of age, 13 to 15 grains. Of course, when the antipyretic effect commences, this dose must be diminished, while larger doses are, according to the author, never required. In cases of broncho-pneumonia in children, where hectic fever sets in, with high evening exacerbations and morning remissions, antipyrin, or any of the aromatic order of antipyretics, will be of value. The dose which he then administers is, for children from 11 to 15 years of age, 12 to 15 grains; although the author, as seen, gives the preference to antipyrin as an antipyretic, he nevertheless refers to acetanilide and antifebrin as likewise, in cases of erysipelas and acute rheumatism and pulmonary tuberculosis, satisfactory antipyretics, while antifebrin possesses the advantage over antipyrin in more seldom leading to the production of exanthematous eruption.

SPERMINE AND PIPERAZIDIN.

In June, 1889, Brown-Séquard made the statement before the Société de Biologie of Paris that extracts from the testicles of young animals, when subcutaneously injected, produced marked stimulating effects upon the nervous system, supporting his statement by the report of experiments made on animals and observations made upon himself. The interest which these statements excited was only equalled by that caused by the recent claims of Koch, and although Brown-Séquard's conclusions, perhaps exaggerated as much as Koch's, were confirmed by a very large number of observers, they have now passed, we might almost say, into obscurity.

We have on a previous occasion published an account of the investigations conducted by Messrs. Parke, Davis & Co. as to the properties of spermine, which it was suggested to substitute for the testicular extract; while Poehl, in St. Petersburg, has recently made and published a study of the physiological action and therapeutic application of this substance.

Spermine is an organic base, whose phosphate forms crystalline salts, which were first recognized in 1853 by Charcot and Robin in the spleen in cases of leukæmia, and were hence called Charcot's crystals. Later Förster and Hartung recognized these crystals in bronchitic sputum, while Charcot and Vulpian found them in the blood in leukæmia; Wagner detected them in the portal blood of an anæmic woman; and Böttcher discovered them in dried human semen. Neumann also discovered them in the spinal marrow in leukæmia, and in the normal condition, in nearly all bodies examined for this purpose.

Schreiner, in 1878, prepared the crystals from semen, from calf's liver, the calf's heart, and the testicles of the bull, and recognized in the phosphoric salt a new organic base, to which analysis gave the formula of C_2H_5N. In 1888, Ladenburg and Abel, by heating muriate of æthylendiamin, obtained in small amounts a body to which the name of æthylenimin, with a formula of C_2H_4NH, was given, a substance in all probability identical with Schreiner's base.

The physiological action of this base, discovered by Schreiner, or spermine, was studied by Kobert a long time time before Brown-Séquard's experiments, and recognized by him as not poisonous. Recently, PROFESSOR TARCHANOW made a number of experiments with the spermine prepared by Professor Poehl from the testicles and prostatic glands of young bulls and stallions, and his observations are published in the *Therapeutische Monatshefte* for January, 1891. He observed that after injection into the blood there was slowing of the pulse, with increased vigor of the heart's contraction, elevation in the pulse wave, and marked reduction of blood pressure. Under his directions a number of experiments were made by different observers on sterilized one and two per cent. solutions of the hydrochlorate of spermine, and its stimulating activity on the central apparatus was more or less confirmed. Kobert, however, maintains that these conclusions are not substantiated, for, in diseases where spermine is present in increased quantity, the specific action of spermine is nearly always absent, and only one such case has been reported where such a patient suffered from marked priapism. Recently still another preparation has been placed on the market, at first under the name of "spermin," later under the designation of "piperazidin." This substance occurs in colorless crystals, readily soluble in water, possessing no caustic properties, and forms readily soluble crystalline salts with hydrochloric acid. It seems from chemical examination that this body is absolutely identical with Schreiner's base, and Dr. Hoffmann, after subjecting it to chemical

analysis, recognizes it as diathylendiamin, with the formula—

$$C_2H_4<\begin{matrix}NH\\NH\end{matrix}>C_2H_4.$$

Yet the properties of this body vary in such a degree from those of æthylenimin that it can scarcely be conceived that the two bodies are identical, though Dr. Hoffmann writes that he has not yet been able to compare piperazidin with Schreiner's base.

Dr. Bock has made a few experiments on animals in the Berlin Pharmacological Institute with this substance, piperazidin, and states that in no instance did he succeed in obtaining any evidence of any stimulating properties whatever. On a few occasions in the rabbit, after subcutaneous injections, there was a slight transient acceleration of the pulse, which might, however, with probability, be attributed to the operative procedure itself. There was never any increase of blood-pressure. If, however, large doses—7½ grains or more—were injected into the veins, there was temporary depression of blood-pressure, which, however, soon regained the original height, and is no evidence of any special action. The results deviate in the most marked degree, therefore, from the conclusions drawn by Tarchanow with the spermine prepared by Poehl. So, also, as to its general stimulating properties, the author's experiments failed to furnish any affirmative evidence.

There is a property possessed by this substance, however, that may be of therapeutic value, and that is its relation to uric acid. It is claimed that piperazidin in cold, watery solution dissolves twelve times as much uric acid as carbonate of lithium, and a combination formed of uric acid and piperazidin is seven times more soluble in water than uric acid and lithium. 1 part of uric acid and piperazidin dissolves in 50 parts of water, while uric acid lithium requires 368 parts to obtain solution. Even in great excess of uric acid, no acid salt of it is formed, but always the readily soluble neutral salt.

FERRIC BROMIDE.

Dr. Hecquet, formerly physician to the Abbeville Hospital, very strongly recommends the perbromide of iron or ferric bromide in many affections in which it is desirable to soothe without depressing, and to strengthen without exciting. Out of twenty-five cases of spermatorrhœa treated by this drug nineteen were completely cured, two only being unrelieved, and in these cases complications were present in the form of prostatic enlargement and stricture of long standing. The perbromide was frequently found useful in cases of chloro-anæmia, leucorrhœa, hysteria, amenorrhœa, hydræmia of pregnancy, chorea, epilepsy, diabetes, and tuberculosis. In conjunction with Dr. Vacossin a series of trials were made in the Abbeville Hospital on its action in cases of cardiac hypertrophy, with the result that Magendie's observations, made more than fifty years ago, were confirmed, the patients being strengthened and relieved by the calming of the palpitation and of the dyspnœa. This combination is well borne, even by irritable stomachs. It may be taken in solution, or in lozenges, the dose being from 3 to 5 grains. The action is more rapid than that of most iron compounds, as its good effects begin to manifest themselves in cases of chlorosis during the first week of administration, a complete cure being generally obtained in a month. Dr. Hecquet has found by experience that the ferric salt Fe_2Br_6 acts both more rapidly and gives more permanent results than the ferrous salt $FeBr_2$, and hence he has latterly confined himself to prescribing the former, which he does not hesitate to say is endowed with exceptionally valuable properties, and deserves to be far better known and more employed than it has hitherto been. There is a preparation of the ferrous salt in the Pharmacopœia of the British Pharmaceutical Conference, which, however, is not very largely prescribed. No preparation of the ferric salt seems to be known in this country. —*Lancet*, February 14, 1891.

PERMANENT SLOW PULSE.

At the meeting of the Société Médicale des Hôpitaux, held February 6, 1891, a number of instances of abnormally slow pulse were reported (*La Tribune Médicale*, February 19, 1891). Dr. Comby reported the case of a woman who, without any hereditary defect, suffered two years ago with frequent attacks of vertigo. In July, 1890, œdema of the legs occurred, and it was then found that the pulse was but 38 in a minute. There was intense dyspnœa, with violent paroxysmal crises. The radial arteries were not atheromatous, there was no intermittence, no irregularity, and no enlargement of the heart with the exception that the heart was dilated at its apex in the sixth interspace, there was

emphysema without bronchitis, nothing else abnormal was detectable. Bromide of potassium was administered for eight days, in the dose of 30 to 60 grains, without producing amelioration. Caffeine was then given, in the dose of 15 grains, injected subcutaneously. On the 20th of January the patient was placed on exclusive milk diet. There was increase of the amount of urine passed, and diminution in the frequency and intensity of the attacks of dyspnœa, the pulse, nevertheless, remained at 32. The author attributes the attacks of vertigo and dyspnœa to a uræmic origin.

DR. HUCHARD stated that he had observed six cases of permanent slow pulse; one occurred in a man 34 years of age, who suffered from angina pectoris, vertigo, and loss of consciousness. Ordinarily his pulse was 80 in a minute, but on the approach of these attacks of loss of consciousness it fell to 50, 40, or 30, finally being permanently slowed. Then after a while the urine was found to contain albumen, and the patient finally died suddenly with symptoms of uræmia.

He believes that the syncope and the epileptiform attacks, as well as the slow pulse, are probably due to ischæmia of the medulla oblongata, and that the dyspnœa, albuminuria, cardiac, and renal symptoms are attributable to arterial sclerosis. From a therapeutic point of view he believes there are three points to be met with.

First.—To combat the medullary ischæmia with nitroglycerin, 8, 10, or 12 drops, with nitrite of amyl in the violent attacks of dyspnœa.

Second.—To renew the power of the heart, not by digitalis, which is contraindicated, but by caffeine, coffee, or tea.

Third.—To prevent renal accidents, or to combat them by milk diet.

DR. CHANTEMESSE also stated that he had observed a case of permanent slow pulse, with epileptiform convulsions and albuminuria. At the autopsy, general atheromatous lesions were found, although there was no atheroma of the medullary arteries.

DR. LAVERAN stated that he had also had under his care a patient suffering from permanent slowed pulse, although the urine contained no albumen. Nux vomica relieved the accompanying symptoms, but without any modification of the pulse.

DR. RENDU stated that among the patients who presented permanent slow pulse some few have cardiac defects, others renal defects, others atheromatous, but all are not uræmic, and he stated that he had under his care for the last three months a patient who had never had the least evidence of disease, and in whom the pulse normally seemed to beat only 16 to 18 times a minute. Nothing seemed able to modify this rate, neither coffee, tea, oxygen, climbing, or horseback-riding. He was unwilling to admit that uræmia was latent, and believed that permanent slow pulse might be attributed to numerous causes.

THE ACTION OF ANTISEPTICS ON THE PERITONEUM.

DRS. DELBET, GRAND'MAISON, and BRENET (*Annales de Gynécol.*, January, 1891) announce the result of a series of experiments performed to ascertain the action of antiseptics upon the peritoneum. They admit that there are certain disadvantages in the use of antiseptics. In the resistance of a healthy system to micro-organisms, cells play an active part. All antiseptics are poisons to bacilli, and if poisonous to these simple unicellular organisms, they are also poisonous to the highly complicated multicellular tissues in the human body. If, then, any antiseptic kills bacilli, it must also destroy some of the cells belonging to the patient's body which it touches. The destruction of these cells diminishes the resisting power of the subjacent tissues, and should the antiseptic have failed to kill all the bacilli in the neighborhood, some of the surviving germs may enter the unprotected tissues. In the case of superficial wounds dressed with antiseptics, the good done by germ destruction must greatly exceed the harm caused by damage to connective-tissue cells, which have feeble resisting powers against bacilli; on the other hand, the peritoneal endothelium is now known to resist the incursion of germs with great vigor as long as it is healthy and uninjured. Larnelle never succeeded in finding a single bacillus within the substance of a peritoneal endothelial cell. Possibly these cells secrete a substance which poisons bacilli. When the endothelium of an area of the peritoneum is damaged or destroyed, the resisting power of that serous membrane is greatly impaired. The common connective tissue cannot offer adequate protection to the system. May not antiseptics destroy the endothelium, or, at least, set up grave changes, impairing its resisting powers? To settle this question, Drs. Delbet and his colleagues have undertaken the experiments which they now describe.

Their method consists in carefully touching up a tract of mesentery in a dog with an antiseptic, and then flushing the peritoneum. Another tract is treated in the same way, and the peritoneal cavity is once more washed out. At the end of a stated time the animal is killed. With manifold precautions pieces of the mesentery treated with the antiseptic are removed and compared with other portions not so treated. The endothelium was stained with nitrate of silver. The nuclei seemed unaffected, but the protoplasm underwent great changes. The first modification was a retraction of the endothelial cells at their pointed prominences. Hence little black spots appeared where the meshes of the well-known net-work pattern, formed by contiguous endothelial cells, crossed each other. This "angular retraction" passed into "angulo-marginal retraction." Black points appeared at first along each mesh, indicating partial separation of the margins of contiguous cells. When the separation was complete, the meshes looked unusually thick. The next stage is "fragmentation," the protoplasm becoming granular and breaking up. Partial, and lastly complete, desquamation follows. The above stages are produced more rapidly or slowly according to the power and nature of the antiseptic, some agents causing desquamation at once. In any case the endothelium, a bulwark against sepsis, is distinctly damaged.—*British Medical Journal*, February 21, 1891.

THE CONDENSATION OF INFANTS' FOOD.

None of the excellent formulæ which physicians have devised for feeding in rearing infants can claim to provide the article which is most convenient for unskilled use, and these plans are, therefore, adopted only when the child has fallen ill and is under medical advice. Prevention is undoubtedly better than cure, and if any impression is to be made upon the present mortality of hand-fed children, it must be through taking account of the convenience of their attendants, so that what is most approved of by the profession may also be that which from the outset is naturally adopted.

The custom of condensing milk is that which naturally suggests itself, especially since condensation assists sterilization, which has been shown to be desirable, and a uniform article is also furnished and an opportunity afforded for adding those ingredients which are considered necessary in a substitute for human milk. The more expensive milks, such as that of the ass, might be treated by this process; but for the present it is sufficient to consider only that of the cow, and a paper published by MR. J. B. NIAS, in the *Practitioner* for January, 1891, offers many practical points of interest.

Accuracy requires that fat should be added to cow's milk. This must practically be in the form of cream, which is expensive, and, until very recent years, has been obtained from milk that has more or less soured. Some advisers have endeavored to evade this necessity by adopting, as their basis, analyses which support the contention that cow's milk of itself contains enough fat for an infant's food; but this proposition is difficult to support by modern standards, while the invention of the separator, and the method of condensing milk, render it no longer necessary.

The uniformity of cow's milk has no parallel in that of the human species. It is not every specimen of the latter which is fit to nourish a child. A good standard is, consequently, all important for the preparation of a substitute. The analysis most generally used by medical men is that furnished by Vernois and Becquerel, presumably because it is based on the imposing number of eighty-nine individuals; but a study of their memoir will lead to the conclusion that a great deal of industry was uselessly applied, and that their results are not so valuable as many others that were obtained from less extensive data. Briefly, these experimenters did not completely dry their solids, extracted the fat imperfectly, estimated the sugar in an impure solution by the polariscope, and calculated the casein by difference only; with the result that the casein is put too high, and the fat and sugar too low. These faults were at once exposed by Poggiale. If the analysis of cow's milk given by these authors is also used, their errors are for our purpose neutralized; but this is not generally done. Whatever standard be used, it should be modern, and, as an example, the author transcribes three, and appends some calculations based upon them. It must be understood, however, that these are not to be accepted implicitly, but merely as indications of the method to be followed for the end in view. The following is given as the percentage composition of human milk by

	Proteids.	Fat.	Sugar.	Salts (ash).	Water.
Foster.....	2.0	2.75	5.0	.25	90 0
Blyth.....	3.0	2.90	5.87	.16	88.2
Church.....	1.8	4.0	7.0	.3	86.7
V. and B....	3.9	2.6	4.3	.13	88.9

and cow's milk—

	Proteids.	Fat.	Sugar.	Salts (ash.)	Water.
Foster.....	4.3	4.0	4.4	.6	87.0
Blyth.....	4.75	3.5	4.0	.7	87.0
Church.....	3.4	3.8	5.0	.8	87.0
V. and B....	5.5	3.6	3.8	.6	86.4

The quantity of food taken by an infant should, like that of an adult, bear some ratio to its weight. Setting the total absence of exertion against the rapid growth, it may be assumed that an infant will take, like an adult, at least $\frac{1}{100}$ part of its body-weight in solids per diem; and also, for convenience in calculation, it may be assumed that an infant will weigh at birth 8¼ pounds, and will increase pretty regularly to 25 pounds at 12 months old. At this age, in this country, weaning usually begins. If, again, the solids of human milk be taken at ten per cent., and a pint at sp. gr. 1031 to weigh 9000 grains, a pint will yield $2\frac{1}{2}$ ounces avoirdupois of solids. From this it may be inferred that an infant at birth will require ⅔ pint, and at 12 months old 2 pints, of its mother's milk, which, for a minimum, is in accordance with most estimates. When we deal with these quantities, the exact percentage of the ingredients becomes important. When the fat is taken as oil of specific gravity 920, 50 grains will fill a teaspoonful, so that the quantity required at birth is 3 to 4 teaspoonfuls, and at 12 months old 3 to 4 tablespoonfuls at the least. The great question in substituting cow's milk for human milk is, Shall the fat be sufficient and the casein in excess? Because we must have one or the other. Sugar is but an imperfect substitute for fat, and cream, as generally used, has its drawbacks. The mortality of hand-fed children being greater than of those at the breast, we have still a great deal to make up in our efforts at rearing; it is, therefore, worth while to scrutinize this question closely.

The ejection of large curds from the stomach by vomiting the author regards rather as evidence of atony and deficient peristalsis of the stomach than of simple irritation of the mucous membrane, so that this condition of the ejection of large undigested masses need not necessarily be put down as attributable to the quality of the food,—that is, the indigestibility of cow's milk, but should be attributed to the quantity, for the excess of which vomiting is the natural remedy. Again, as we know by the example of cheese that curd is more digestible when it contains abundance of fat, the most irritating and indigestible curd will be that precipitated from skimmed milk, or milk much diluted with water. Before turning, then, to peptones and other albuminous substances, it is reasonable to try the effect of a good rich quality of cow's milk in exactly the right quantity and properly diluted. Again, it should be remembered that the yield of the human breast and the capacity of the child's stomach correspond, 5 fluidounces being the most that can be secreted or taken at one time. It is curious that feeding-bottles are rarely graduated, and the medical attendant should not be above doing it himself on occasion. So much as regards indigestion. Next, as to quantity.

If care is taken, the casein of cow's milk will not prove troublesome, and the author does not believe in the advantage of substituting vegetable for animal proteids, the gluten of flour in particular. Egg albumen, he thinks, is somewhat better, and part of the yelk of an egg added to highly-diluted milk will often render it tolerated. As the weight of the yelk of an egg is nearly three hundred grains, it will furnish the requisite solids to more than a pint of milk, so that discredit can be brought on this article also by its excessive use.

Taking the above three analyses of Foster, Blyth, and Church, it will be found that the quantity of cow's milk to be given to a child at birth (diluted with water to make up ⅔ pint) will be 7, 9, and 11 fluidounces, respectively, if the quantities of casein are to be rendered equal; and 9, 11, and 14 fluidounces if the fat is to be rendered equal; giving, in the one case, deficiencies of 45, 41, and 123 grains of fat, and, in the other, excesses of 81, 86, and 100 grains of casein. And to equal the quantity required, of 2 pints, at 12 months old, we must take of cow's milk, 1, 1⅓, and 2 pints, respectively, if we wish to equalize the casein, which will give a deficiency of 135, 124, or 369 grains of fat; or, for equal quantities of fat, we must give 1⅓, 1⅝, or 2 pints of cow's milk respectively, with excesses of 243, 264, or 300 grains of casein. Every one can appreciate these figures; and similar calculations have led others to the recommendation of cream, whenever practicable, which is but seldom, the previous acidulation of the milk rendering it unwholesome. The daily quantity required runs from a teaspoonful at birth to a tablespoonful at 12 months old. With the use of a separator and tinned preparations, the addition is feasible and very desirable.

The addition of sugar presents no difficulty. As to the salts of milk, the published analyses are mostly very old, and are copied from one work to another in a surprising way. The most important point to note is that, in a daily allowance of 1⅓ pints of cow's milk, there will be an excess of about 7 grains of potassium

chloride and a deficiency of 8 grains of calcium phosphate. The solution of calcium phosphate in milk is a difficult problem. The clearest possible correspondence in the salts should be aimed at, because they have some relation to the casein, and determine the flavor of the milk, which, as remarked before, is as important with the food of an infant as with that of an adult. Doubtless much indigestion in the infant can be put down to the want of flavor in its food, for which reason carminatives and stimulants give the relief which they do with improper diet.

The sum of the foregoing is, that it would be a step in advance to introduce a condensed cow's milk, with the addition of ¼ to ⅓ of the natural fat, and not more than 1¼ to 1½ times the natural sugar, and such salts as may be found possible and desirable. How far this would keep without additional sugar can only be tried.

Quantity is, however, the most important point, and the mishaps which happen with infant feeding are more often due to the manner than to the material. As little should be left to discretion as possible. The supply of mother's milk is limited and regular, that of the substitute may be neither. Directions, therefore, should be more precise, and a teaspoonful of condensed milk first taken from the pint, and the surplus allowed to run off, will average 200 grains. These milks generally require about five times their weight of water to give about two and a half per cent. of casein, and the above teaspoonful thus would be 2½ fluidounces or by measure 1 to 20.

It is of advantage to be able to analyze in some ready way the milk which a child is taking. If it be boiled in a test-tube with a few drops of liquor potassæ or sodæ, and the tube plugged with cotton-wool and allowed to stand, the fat will rise almost completely to the top, and may be assisted to do so with a little ether or benzine. The underlying fluid can be tested by the microscope, or by drying on a piece of paper for fat; the separation is usually pretty complete. The proteids can afterwards be precipitated by any usual method, and estimated, as in urine. This method appears rough, but is sufficient to show what is wrong with the food. Too much water and too little fat are the most frequent defects, and are easily remedied. It is a great mistake to wait for the appearance of rickets before giving an infant its proper physiological ration of fat. Cream, cod-liver oil, yolk of egg, or suet boiled in the milk are preventives of numerous maladies for them; but they are seldom thought of till too late.

Reviews.

SAUNDERS'S QUESTION COMPENDS, No. 2. ESSENTIALS OF SURGERY. By Edward Martin, A.M., M.D., Instructor in Operative Surgery, University of Pennsylvania, and Assistant Surgeon to the Hospital of the same; Surgeon to Howard Hospital. Fourth edition.

Philadelphia: W. B. Saunders, 1891.

That Dr. Martin's admirable compend upon surgery has proved its sterling worth to students, both in this city and elsewhere throughout the country, is readily recognized, when we consider that only two years have elapsed since the book made its appearance. In that short interval its popularity has exhausted three large editions, so that the volume before us is the fourth revision.

The original form of the book, giving question and answer, with the arrangement of topics, is the same as in its former editions, but in numerous places the answers are given somewhat more in detail, and here and there new matter is introduced in keeping with the many recent advances in surgery. The appendix, which is entirely new, comprises several hundred selected and standard prescriptions applicable to the treatment of all sorts of surgical affections, together with very full directions for the preparation of the various dressings, solutions, and ointments used in antiseptic surgical procedures. The list of diseases here treated of is arranged alphabetically, and all the appropriate formulæ are thus readily obtained by simply turning to the required disease. The plates illustrating and elaborating the text are both numerous and very cleverly executed. The book, in its present form, we feel certain, will be a most valuable aid to the busy practitioner, as well as to the student preparing for examination. W. D. G.

A DICTIONARY OF PRACTICAL MEDICINE. By various writers. Edited by James Kingston Fowler, M.A., M.D., etc.

Philadelphia: P. Blakiston, Son & Co., 1012 Walnut Street, 1890.

Some men learn about all they know of progressive medicine from condensation. In the hurry of life, anything which will save time is worth owning, the only trouble being that the same hurry that threatens to outstrip the reader leaves behind it a waste and wreck of epitomes, abstracts, dictionaries, encyclopædias, so that the one to read and consult,

if we would save our moments, is the last and freshest.

The contributors give the rank to a book of this sort. Abercrombie, Carter, Cayley, Coupland, Cruikshank, Horsley, Money, and many more names familiar with permanent and evanescent British medical literature are on the list, and a somewhat extended reading of the book convinces us that its claims to recognition as a medical dictionary safe to consult, as being abreast of the time, are warranted by its contents.

E. W. W.

THE PHYSICIANS' AND STUDENTS' READY REFERENCE SERIES, No. 5. ELECTRICITY IN THE DISEASES OF WOMEN, WITH SPECIAL REFERENCE TO THE APPLICATION OF STRONG CURRENTS. By G. Betton Massey, M.D., etc. Second edition. Revised and enlarged.

Philadelphia and London: F. A. Davis, 1890.

Those who read with interest Dr. Massey's first edition, and perceived the exhaustive character of the work, will be glad to find it carried still further in the present volume. While the value of electricity is still under dispute in the class of cases in which Dr. Massey applies it, there is all the more reason for a careful hearing of the claims of each earnest investigator. The chapters on "Chronic Inflammatory Diseases of the Appendages" are the centre of interest at present, and in this question of electricity *versus* operation are sure of being carefully weighed and discussed by the great jury of the active medical world. E. W. W.

MASSOTHERAPEUTICS; OR, MASSAGE AS A MODE OF TREATMENT. By Wm. Murrell, M.D., F.R.C.P., etc. Fifth edition.

Philadelphia: P. Blakiston, Son & Co., 1890.

This horrible name vainly strives to conceal the sterling merits of Dr. Murrell's work. The author himself feels called upon to extenuate it, and argues its claims as indicating something more, as a title, than massage. Massotherapeutics, he says, meaning massage, in a scientific aspect, as a therapeutic agent, and not merely a means of earning a living or keeping a "modified form of hotel." To the words of praise which we have been disposed to give this book in reviews of the earlier editions, we can only add that the present one contains some new matter and new illustrations. Of its great value to the conscientious searcher for new therapeutics we are as confident as ever. E. W. W.

Correspondence.

BERLIN.

(From our Special Correspondent.)

The latest publications concerning the Koch treatment of tuberculosis report great success in the majority of cases. Experimenters now begin treatment with very small injections, say one decimilligramme, and slowly and carefully increase the dose. By this means the febrile reaction and the unpleasant complications are avoided, or, at least, decreased, and the patient can finally stand very large doses. More favorable reports are also being received from foreign countries. In Holland, for instance, at first the treatment was very severely criticised, while now it is quite highly praised. It seems settled, as Koch claimed, though many experimenters have forgotten it, that the treatment is mainly suited to cases of beginning phthisis. Virchow's papers, showing the anatomical changes that, in certain conditions, the remedy may cause, have been of great advantage both to the method and to suffering humanity.

In the mean while, Professor Liebreich has announced a new remedy for tuberculosis,—namely, the potassium and sodium salts of cantharidic acid. He regards it as especially useful in laryngeal affections. It is used hypodermically in doses of from 1 to 4 decimilligrammes. So far experiments with it have resulted favorably. Its effects in pulmonary phthisis and tuberculosis of the skin have not as yet been accurately determined. It has acted excellently in simple laryngeal catarrh, and has also been employed in diseases of the eye, diphtheria, etc.,—*i.e.*, in processes in which thick transudations and hardening of the tissues occur. The subject deserves thorough investigation.

The great increase in the use of the hypodermic method of exhibiting medicines has led to improvements in the instrument. When strict accuracy in measurement is required, as, for instance, in the Koch treatment, the Pravaz syringe is useless, since oftentimes the cylinder contains one and a half instead of one gramme, and the scale is incorrect. In the Koch syringe, in which suction and expression are produced by a rubber ball, there are also many disadvantages. Dr. Geo. Meyer, of Berlin, has invented a new instrument, made by H. Windler, Doroteen Strasse 3, which is believed to be without fault. Its

advantages are that the liquid cannot come in contact with metal, and so oxidation, etc., are avoided. The instrument can be easily and quickly taken apart, cleaned, and disinfected. It is quickly prepared for use by moistening the asbestos head of the piston. It is especially adapted to disinfection by absolute alcohol, which is so strongly recommended by Koch.

It is stated that soon one or two new methods of treatment of tuberculosis will be published. Who the authors are is not yet known with certainty. The future alone will show which method is best adapted to individual cases, though certainly so far much may be said in just praise of Oscar Liebreich.

During the Koch discussion an important point, deserving consideration, has arisen,—namely, the employment of fat in surgical tuberculosis. Dr. Schleich recommends it highly. He has noticed in a great number of cases that the tuberculous granulations completely disappear if the wounds be thoroughly covered with fat, vaseline, etc. This led him to the thought that in many infectious diseases the mechanism of the taking up of micro-organisms by the leucocytes sufficed to explain the curative influence of various agents. Restoration of cells and avoidance of injury to the tissue is especially to be regarded. If, now, the leucocytes can be increased in the tissue itself, without the latter being affected, certainly the diseased condition will be altered for the better. The remedy must be taken up by the leucocytes in the same manner as bacilli are. As regards fat, this process can be followed under the microscope. It is interesting that among the people fat has long been used, and successfully, as a remedy against phthisis. As we all know, physicians have long used cod-liver oil. Further, tuberculosis is principally found in tissues poor in fat,—the lungs, serous cavities, kidney, and liver; while tissues rich in fat—for example, the subcutaneous tissue—are seldom the seat of this disease. Pure fat, in form of olive oil, has lately proven to be a useful remedy. Siegfried Rosenberg, following the example of many foreign physicians, has used it with much success in cases of gall-stone. He also justifies its use from experimental studies concerning its influence on the secretion of gall and on digestion. Shortly after the exhibition of large doses, the calculi are passed and the patient relieved. Very recently Senator has spoken very highly of lipanin, and has used it instead of oil. Unlike cod-liver oil, it does not in any case interfere with digestion.

BERLIN, March 17, 1891.

Notes and Queries.

A NEW FATTY ACID IN COW'S BUTTER.

It has long been known that the acids arising from the saponification of butter include small proportions of butyric, caproic caprylic, and rutic acids. The larger proportion of the acids has, up to the present time, been held to consist of palmitic, oleic, and stearic acids, which are non-volatile and insoluble in water. In a paper published in the *Lancet* for February 14, 1891, J. ALFRED WANKLYN announces that he has discovered that the main acid is not palmitic acid, but an acid quite distinct from palmitic acid, both in composition and properties.

This new acid, which is so abundant as to amount to about half of the weight of the dry butter, differs from palmitic acid by containing less hydrogen, its formula being $(C_{15}H_{30}O_2)n$. The melting-point of the new acid is about 50° C., whereas palmitic melts at 62° C. The new acid possesses the extraordinary property of consolidating or gelatinizing alcohol. At temperatures below 5° C. it gelatinizes more than five times its weight of alcohol. Part of the alcohol is held mechanically by a sponge-like action, and part is retained in chemical combination. Palmitic acid possesses no such property, nor does any other substance resemble this new acid in this particular.

PHOTOGRAPHING IN COLORS.

The invention which has recently been announced from Paris, of a method of communicating color to a sensitive photographic film by the action of a ray of colored light, will, if confirmed, awaken very wide-spread interest, for it is impossible to foresee all the applications to which such a discovery might be expected eventually to lend itself. The idea is credited to M. Lipmann, a professor of the Sorbonne and a physicist whose name is already widely and favorably known in connection with some highly ingenious instruments of physical research. The theory

which he is said to have successfully embodied in experiment is that the interference of two rays of light of the same wave-length may be caused to produce a characteristic effect upon a sensitive film, such as amounts to dyeing the film of the particular hue in question. So far as has at present been explained, the process appears to depend upon the doctrine that the chemical action, like the chromatic properties, of a ray of light is capable of being affected by the conditions which give rise to the phenomena of interference. In itself this seems likely enough. It is well known that if two rays of light having the same wave-length travel along the same path simultaneously, they interfere with one another. It may and does happen that at certain points along the path, depending for their position on the wave-length, the two impulses tend to counteract, and at other points to reinforce one another. A luminiferous particle—whatever that may be—which is acted upon by two opposing forces will remain at rest if the forces are equal as well as opposite; while if the forces be not equal or not directly opposed, there will be some resulting disturbance, but still a disturbance different from that which would have been produced by either of the co-incident forces acting alone. From this cause arise all those beautiful optical effects of interference which so strikingly illustrate the undulatory theory of light. Now, if it be a fact that the chemical activity of a ray of light is subject to the same law, and can be either exalted or depressed by causing a second ray of the same wave-length to act upon the sensitive reagent, it is quite conceivable that a pair of rays of light might be so directed through a photographic film as to cause not a uniform, but a sporadic deposit of the precipitated element. These minute deposits would in that case be distributed at definite distances apart along the line of the common path of the active rays, because they would mark the points of co-operating, and therefore exalted activity. Similarly, their intervals would occupy the spaces in which the antagonism of the two rays had reduced or even destroyed the actinic effect. Now such a film would apparently be opaque to any light not having this particular wave-length, because at some point it would necessarily be absorbed by the opaque deposit. But if a ray of the same wave-length impinged, it might be able to pick its way successfully between the deposits. Professor Lipmann is said to have produced such a film by the expedient of placing a mirror at the back of his sensitive plate, and causing the focused ray to return along its own path. The mirror is produced by making the plate one side of a mercury-trough, which when filled constitutes a mirror in exactly the desired position. The expedient, if successful, is certainly charmingly simple, and, seeing that the healing art would undoubtedly benefit in as high a degree as any by a practicable system of chromatic photography, we look with lively interest for some further information upon the theory and practice so ingeniously originated.—*British Medical Journal*, February 21, 1891.

URALIUM OR CHLORAL-URETHAN.

Uralium or chloral-urethan, which was very strongly recommended early last year by Dr. Poppi, of Bologna, as being a better hypnotic for insane and neurotic patients than most other drugs of this class, has recently been carefully tested by MM. SCHMITT and PARISOT, of Nancy, who administered it in an alcoholic solution in a variety of cases where the patient suffered from insomnia. The smallest dose that was at all effectual was 15 grains, but doses of even 38 grains were by no means always successful; indeed, less so than chloral or opium. Added to the uncertainty of its effects, it was very disagreeable to take, and often disordered the digestion, and sometimes caused vomiting, followed by nausea, which lasted for some days. In two cases, too, vertigo was complained of. It would seem, therefore, that Dr. Poppi's good opinion of uralium is not shared by the French observers.—*Lancet*, January 10, 1891.

TREATMENT OF THE ALGID STAGE OF CHOLERA.

In the Fiume Hospital the method by which the algid stage of cholera was treated during the last epidemic was by giving gum ammoniac internally, together with stimulants, and injecting sulphuric ether hypodermically. According to DR. RITTER VON GIACICH, the director of the hospital, this plan, which was always adopted, proved most successful, a great improvement taking place

in fifty per cent. of the cases in a couple of hours' time. This made itself manifest not only by a rise of temperature and a stronger pulse, but also by the expression of the face becoming less pinched and anxious, after which the patient made good progress towards convalescence. Warm baths were often administered with advantage. Where three hours elapsed after the treatment above mentioned, without manifest improvement, the case always proved fatal.—*Lancet*, November 1, 1890.

OFFICIAL REPORT ON KOCH'S TREATMENT.

The following are tabulated conclusions of the results of the observations made by the various professors and chiefs of clinics in the different Prussian universities with Koch's remedy for tuberculosis. Nearly sixty reports in all are included in this volume, and, as might be expected, they are of very unequal value, some being so scanty and containing so little accurate information that they might with advantage have been entirely omitted. One of the most striking points in the character of these reports is the great variations in the methods employed by different observers, some only employing three injections, while others administered as many as eighteen or nineteen to each patient, so that these sets of cases should be put on very different footings, and the conclusion is still further substantiated that it is as yet impossible to give any definite opinion on the value of the method, principally because sufficient time has not yet elapsed to establish the permanence of the so-called cures.—*British Medical Journal*, March 14, 1891.

TABLE I.—*Statistical Statement of the Action of Koch's Fluid in Tuberculosis of Internal Organs.*

Diseases.	No. of cases treated.	Cured.	Substantially improved.	Improved.	Unimproved.	Died.
I.—PULMONARY TUBERCULOSIS:						
1. Early pulmonary phthisis	242	9	72	59	93	0
(*a*) With laryngeal tuberculosis	30	0	10	6	13	0
(*b*) With tuberculosis of other internal organs	7	0	1	2	4	0
(*c*) With other diseases	8	0	0	1	6	0
2. Moderately-advanced pulmonary phthisis	444	1	68	68	278	6
(*a*) With laryngeal tuberculosis	85	1	10	11	37	2
(*b*) With tuberculosis of other internal organs	15	0	1	4	5	2
(*c*) With other diseases	14	0	0	0	7	2
3. Very advanced pulmonary phthisis (cavities)	246	0	7	31	162	30
(*a*) With laryngeal tuberculosis	60	0	1	4	45	5
(*b*) With tuberculosis of other internal organs	24	0	1	2	17	1
(*c*) With other diseases	16	0	0	1	7	5
I.—PULMONARY TUBERCULOSIS (all grades taken together)	932	10	147	158	533	36
(*a*) With laryngeal tuberculosis	175	1	21	21	95	7
(*b*) With tuberculosis of other internal organs	46	0	3	8	26	3
(*c*) With other diseases	38	0	0	2	20	7
II.—LARYNGEAL TUBERCULOSIS	63	1	18	23	15	4
With pulmonary tuberculosis	45	0	16	13	12	4
III.—PLEURISY	13	1	0	3	9	0
IV.—PERNICIOUS ANÆMIA	1	0	0	0	0	1
V.—TUBERCULOUS MENINGITIS	4	0	0	1	1	2
VI.—PERITONEAL TUBERCULOSIS	14	1	3	3	4	2
VII.—INTESTINAL TUBERCULOSIS	1	0	1	0	0	0
VIII.—RENAL TUBERCULOSIS	4	0	0	0	4	0
IX.—URETHRAL AND VESICAL TUBERCULOSIS	10	0	0	4	5	1
X.—TESTICULAR TUBERCULOSIS	18	0	2	2	14	0
XI.—DOUBLE TUBERCULOUS PYOSALPINX, with incipient pulmonary phthisis	1	0	0	0	1	0
Total	1061*	13	171	194	586	46

* The difference between the total number of cases and the number in which the result of treatment is given is due to the fact that a few reporters give no information as to the result.

TABLE II.—*Statistical Statement of the Action of Koch's Fluid in External Tuberculosis.*

Diseases.	No. of cases treated.	Cured.	Subsequently improved.	Improved.	Unimproved.	Died.
I.—LUPUS	188	5	78	84	21	0
With tuberculosis of internal organs	27	0	5	6	3	0
II.—TUBERCULOSIS OF SINGLE BONES AND JOINTS	397	9	51	119	211	6
With tuberculosis of internal organs	48	0	1	4	22	1
III.—TUBERCULOSIS OF SEVERAL BONES AND JOINTS	40	0	3	12	23	2
With tuberculosis of internal organs	10	0	0	1	7	2
IV.—TUBERCULOSIS OF LYMPH-GLANDS	38	0	9	7	22	0
With tuberculosis of internal organs	8	0	1	0	7	0
V.—TUBERCULOSIS OF SOFT PARTS	8	0	1	4	3	0
VI.—TUBERCULOSIS OF SCARS	4	0	0	3	1	0
VII.—SCROFULODERMA	6	1	2	3	0	0
VIII.—LEPRA	2	0	0	1	1	0
IX.—RODENT ULCER	2	0	0	1	1	0
X.—TUBERCULOUS ANAL FISTULA	3	0	1	0	1	1
XI.—TUBERCULOSIS OF SHEATHS OF TENDONS	1	0	1	0	0	0
XII.—SCROFULOUS ECZEMA	1	0	0	1	0	0
XIII.—SCROFULOUS KERATITIS OF BOTH EYES	2	0	2	0	0	0
XIV.—EAR-DISEASES	16	0	0	2	14	0
With pulmonary tuberculosis	7	0	0	1	6	0
Total	708	15	148	237	298	9

THE INFLUENCE OF TOBACCO ON GASTRIC DIGESTION AND ACIDITY OF THE URINE.

DR. J. YDAN-POUCHKINE reports a number of experiments which he has made in this connection on seven healthy individuals who were not habituated to tobacco-smoking, and his results are reported in the *Bulletin Général de Thérapeutique* for February 15, 1891.

He first examined the effects of tobacco on the gastric juice and the motility of the stomach and on degree of absorption and on the acidity of the urine. For three days the author examined the gastric juice and motility of the stomach, noting the degree of motion of the stomach by salol, according to the process of Ewald and the rapidity of absorption with the iodide of potassium, according to the method of Zweifel, during a second period of three days each, in which the individual smoked, respectively, twenty-five cigarettes daily. For three days after this period the author continued the examination of their gastric juice in order to determine the after-effects of the tobacco. His conclusions are embraced in the following statements:

1. Tobacco increases the quantity of gastric juice, but diminishes its acidity.

2. The quantity of free hydrochloric acid of the gastric juice is diminished under the influence of tobacco.

3. Proportionately to the decrease of the amount of hydrochloric acid there is an equal diminution of the digestive power of the gastric juice.

4. Tobacco likewise slows the action of the gastric ferments.

5. These modifications in the gastric juice produced by tobacco last for a period of several days.

6. As regards the motility of the stomach and its power of absorption, tobacco is stated to produce an increase of these functions.

7. Tobacco has no influence on the acidity of the urine.

THE PHARMACO-DYNAMICS OF PHOSPHORIC ACID.

In common with most of the officinal mineral acids, phosphoric acid is likewise attributed in therapeutic doses with a moderate power of reducing the frequency of the pulse. In the *Therapeutische Monatshefte*, DR. HUGO SCHULZ maintains that the contrary is the fact, and that so far from phosphoric acid reducing the pulse, a long series of experiments made under his direction on a number of his students have shown him that the pulse under the action of phosphoric acid becomes more rapid than it does before this drug is given.